Clinical Nutrition xxx (2014) 1–10

Contents lists available at ScienceDirect

Clinical Nutrition

journal homepage: http://www.elsevier.com/locate/clnu

Original article

Patterns of dietary supplement use among college students

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ARTICLE INFO

Article history:
Received 16 July 2014
Accepted 29 October 2014

Keywords:
Vitamins
Minerals
Energy
Performance
Protein supplements
Mental energy

SUMMARY

Background & aims: Dietary supplements (DS) are popular in many countries but little data are available on their use by sub-populations such as college students. Since students share a variety of characteristics and similar lifestyles, their DS use may differ from the general population. This study assessed DS use, factors associated with DS use, and reasons for use among U.S. college students.

Methods: College students ($N = 1248$) at 5 U.S. universities were surveyed. Survey questions included descriptive demographics, types and frequency of DS used, reasons for use and money spent on supplements. Supplements were classified using standard criteria. Logistic regression analyses examined relationships between demographic and lifestyle factors and DS use.

Results: Sixty-six percent of college students surveyed used DS at least once a week, while 12% consumed 5 or more supplements a week. Forty-two percent used multivitamins/multiminerals, 18% vitamin C, 17% protein/amino acids and 13% calcium at least once a week. Factors associated with supplement use included dietary patterns, exercise, and tobacco use. Students used supplements to promote general health (73%), provide more energy (29%), increase muscle strength (20%), and enhance performance (19%).

Conclusions: College students appear more likely to use DS than the general population and many use multiple types of supplements weekly. Habits established at a young age persist throughout life. Therefore, longitudinal research should be conducted to determine whether patterns of DS use established early in adulthood are maintained throughout life. Adequate scientific justification for widespread use of DS in healthy, young populations is lacking.

1. Introduction

Dietary supplements (DS) are popular in the U.S., the U.K. and many other countries [1], and their use has been increasing. Recently, in a strongly worded editorial, a leading medical journal advised the public, based on the available evidence, to "stop wasting money on vitamin and mineral supplements" [1]. The authors of the editorial were willing to provide such forceful guidance because they found no convincing evidence such supplements provide any benefit in well-nourished adults, and could be harmful. In 2010, Americans spent $28.1 billion on DS [2]. The most popular DS in the U.S. are multivitamin-multiminerals, botanicals, amino acids and individual vitamins and minerals including vitamins C, E, B-6, B-12, A, magnesium and zinc [3]. When surveyed, individuals state they use DS, in order of overall preference, to "promote general health", "enhance performance and energy", "treat specific

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http://dx.doi.org/10.1016/j.clnu.2014.10.010

health conditions", "improve nutrition", "because the doctor recommended it", "it is good for them" and to "change their lifestyle" [4]. The widespread and increasing use of DS by the American population is the result not only of increasing consumer demand for these products, but a major change in the regulatory status of DS. In 1994, the Dietary Supplements Health and Education Act (DSHEA) became law and dramatically increased the number and type of products that could be legally sold as DS in the U.S. and reduced or eliminated regulatory requirements that previously existed [5,6].

United States law requires that drugs and medical devices be thoroughly evaluated for their safety and efficacy by the Food and Drug Administration (FDA) before their sale is permitted; similar regulatory oversight is not mandated for DS. Claims manufacturers of DS are permitted to make regarding the health benefits of their products are limited, but their marketing can be misleading, and Americans take these products for their purported health benefits [7]. Popular supplements that are widely used by the population have, on a regular basis, been reported to have adverse effects or to be adulterated [8,9]. The FDA has issued warnings on multiple occasions regarding specific supplements, such as ephedra, resulting in their removal from the market [10,11].

Dietary supplements have a unique status in American society. Although they are used regularly by approximately half of the U.S. adult population [12–14] and over 30% of children and adolescents [15], scientific consensus on the efficacy and safety of most DS does not exist, and contradictory scientific studies regularly appear in the peer-reviewed literature [16–24]. Information on DS from a variety of media sources including television, radio, print and the internet is widely available, but the information is often contradictory and confusing.

A majority of DS contain various essential nutrients. In the U.S., the Food and Nutrition Board of the Institute of Medicine (IOM) is responsible for specifying national nutrient requirements as well as tolerable upper intake levels of essential nutrients to avoid adverse effects [25]. However, these national requirements are often ignored by DS manufacturers who include larger amounts of nutrients in their products than recommended by the IOM [26,27].

Although young people are frequently the target of advertising for DS, and specific products are formulated for the youth market, limited information on patterns of use, reasons for use, and predictors of DS intake is available for this population [28–31]. Much of the available information is out-of-date, particularly given the rapid changes in available DS, including continued frequent reformulation of DS by manufacturers to optimize their popularity or address safety concerns [32,33]. Limited data on efficacy of DS in younger populations are available as large clinical trials are often conducted with individuals with illnesses or conditions, such as heart disease, osteoarthritis, Alzheimer's disease and cancer, more likely to be present in older populations [34–38]. Studies, often sponsored by manufacturers of DS, focusing on some aspect of physical performance, have been conducted with younger populations, such as college students or trained athletes with mixed results [39–41].

This study was conducted to assess extent of DS use in five U.S. universities, the reasons for students' use of DS and demographic characteristics of DS users. College students may have different patterns of use than the general population since they have common demographic characteristics, including young age and higher socioeconomic status [42]. Students tend to engage in similar activities such as attending class, studying, participating in sports, attending sporting events and engaging in various other recreational activities. Patterns of DS use, like other personal choices established early in adulthood, may be maintained throughout life [43]. A recent large, longitudinal study that followed over 100,000 volunteers for 20 years clearly demonstrated that the cohort's DS use increased with age [44]. Furthermore, the nature of university life may encourage use of DS in the same way other activities, such as use of alcohol, are encouraged and facilitated by peer pressure [45]. Unlike previous reports, rather than assess DS use at a single college or university, in this study we collected extensive data from students at 5 different types of universities in different regions of the U.S [46].

2. Methods

2.1. Subjects

Five U.S. universities were sampled in 2009 and 2010 for this study: University of Massachusetts Amherst (UMASS), MA, Kent State University (Kent State), OH, California State University Fullerton (Cal State), CA, Louisiana State University (LSU), LA, and Tufts University (Tufts), MA. The final sample included surveys from 1248 students. Five collected surveys were not included in the sample due to incomplete or un-interpretable responses. The schools were chosen to be representative of the major types of American 4-year colleges and universities, including public and private institutions, residential and commuter schools, and various geographic regions of the U.S. College students were recruited through a convenience sample by either an informational booth (UMASS), online (Tufts), or in the classroom (Kent State, Cal State and LSU). Students at the UMASS and Tufts received a $10 incentive to complete the survey and students at Cal State and LSU received a class-based extra credit incentive. The survey was approved by the USARIEM Institutional Review Board and was anonymous.

2.2. Variables

The survey was based on a similar survey previously administered to a U.S. Army sample [47–49]. A total of 47 questions were included on the paper and pencil survey instrument, 14 of these directly addressed the use of DS. The survey included detailed questions on types of DS, frequency of use, reason for use, and money spent on DS. Ninety-two supplements were listed on the survey, which included 56 general supplement types such as multivitamins, combination antioxidants, and specific vitamins and minerals, as well as 36 specifically-named supplements. Participants were instructed to write in supplements they used but were not listed. Before data analysis, individual supplements and supplement types were grouped into standardized categories. Those DS that could not be placed in another category were termed "other". The survey instrument also assessed use of sports drinks, sports bars or gels, and meal-replacement beverages, products that are not considered to be DS for regulatory purposes [5]. The instrument included questions regarding reasons for use of each DS product, specifically: performance enhancement, general health, promoting energy, weight loss, increasing endurance, improving muscle strength, unsure, and other.

The survey collected information on a number of sociodemographic and lifestyle factors, including sex, age, race/ethnicity, family income, aerobic exercise duration, whether the student was attempting to gain or lose weight, overall fitness, and tobacco use. Self-reported height and weight were collected and body mass index (BMI) was calculated (BMI = weight in kilograms divided by squared height in meters, rounded to the nearest tenth). Individuals with BMI <18.5 were considered underweight, those with a BMI ≥18.5–24.9 were considered in the normal weight range, a BMI ≥25.0–29.9 was considered overweight, and those with a BMI ≥30.0 were classified as obese [50]. Students' dietary preference (high protein or low-fat diet) and reason for exercise (to

Please cite this article in press as: Lieberman HR, et al., Patterns of dietary supplement use among college students, Clinical Nutrition (2014), http://dx.doi.org/10.1016/j.clnu.2014.10.010