



Prevalence, Adverse Events, and Factors Associated with Dietary Supplement and Nutritional Supplement Use by US Navy and Marine Corps Personnel

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ABSTRACT

Background About 50% of Americans and 60% to 70% of US military personnel use dietary supplements, some of which have been associated with adverse events (AEs). Nutritional supplements like sport drinks and sport bars/gels are also commonly used by athletes and service members. Previous dietary supplement and nutritional supplement surveys were conducted on Army, Air Force, and Coast Guard personnel.

Objective The aim of this cross-sectional study was to investigate dietary and nutritional supplement use in Navy and Marine Corps personnel, including the prevalence, types, factors associated with use, and AEs.

Design A random sample of 10,000 Navy and Marine Corps personnel were contacted. Service members were asked to complete a detailed questionnaire describing their personal characteristics, supplement use, and AEs experienced.

Results In total, 1,708 service members completed the questionnaire during August through December 2014, with 1,683 used for analysis. Overall, 73% reported using dietary supplements one or more times per week. The most commonly used dietary supplements (used one or more times per week) were multivitamins/multiminerals (48%), protein/amino acids (34%), combination products (33%), and individual vitamins and minerals (29%). About 31% of service members reported using five or more dietary supplements. Sport drinks and sport bars/gels were used by 45% and 23% of service members, respectively. Monthly expenditures on dietary supplements averaged \$39; 31% of service members spent \geq \$50/mo. Multivariate logistic regression modeling indicated that female sex (women/men; odds ratio [OR]=1.76, 95% CI 1.32 to 2.36), higher educational level (college degree/no college degree; OR=2.23, 95% CI 1.62 to 3.30), higher body mass index (calculated as kg/m^2) (≥ 30 / < 25 ; OR=1.67, 95% CI 1.06 to 2.63), and a greater amount of resistance training (≥ 271 /0 to 45 min/week; OR=2.85, 95% CI 1.94 to 4.17) were associated with dietary supplement use. Twenty-two percent of dietary supplement users and 6% of nutritional supplement users reported one or more AEs. For combination products alone, 29% of users reported one or more AEs.

Conclusions The prevalence of dietary supplement use in Navy and Marine Corps personnel was considerably higher than reported in civilian investigations for almost all types of dietary supplements, although similar to most other military services. Factors associated with dietary supplement use were similar to those reported in previous military and civilian investigations. Prevalence of self-reported AEs was very high, especially for combination products.

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D IETARY SUPPLEMENTS ARE COMMERCIALY AVAILABLE products consumed as an addition to the usual diet and include vitamins, minerals, herbs (botanicals), amino acids, and a variety of other products.¹ Marketing claims for some dietary supplements include improvements in overall health status, enhancement of cognitive

or physical performance, increases in energy, loss of excess weight, attenuation of pain, and other favorable effects. It is estimated that about 50% of Americans and 60% to 70% of US military personnel use dietary supplements.²⁻⁴ The Dietary Supplement Health and Education Act of 1994¹ established the regulatory framework for dietary supplements in the United

States. Since the Dietary Supplement Health and Education Act became law, US sales of dietary supplements have increased from \$4 billion in 1994 to \$37 billion in 2014,^{5,6} a more than ninefold increase over 20 years.

Reports of adverse events (AEs) associated with dietary supplements have been published regularly,⁷⁻¹⁰ and a recent study of a nationally representative sample estimated that 23,005 emergency department visits and 2,154 hospitalizations per year could be attributed to AEs from dietary supplements.¹¹ The US Food and Drug Administration (FDA) has banned or warned consumers about specific products,¹²⁻¹⁴ but under the Dietary Supplement Health and Education Act, the FDA has only limited ability to regulate dietary supplements that might pose safety risks. Manufacturers must notify the FDA 75 days before marketing a new dietary supplement, and although the FDA can review marketing claims, FDA approval is not required for retailing the product. The FDA has the burden of demonstrating that a specific product is unsafe either in the pre- or post-marketing phases before taking action, although since 2007, manufacturers are required to notify the FDA about serious AEs.¹⁵

Besides dietary supplements, both athletes and military personnel commonly use nutritional supplements like sport drinks, sport bars, sport gels, and meal-replacement beverages. It is estimated that about 25% to 35% of athletes¹⁶ and at least 25% of military personnel¹⁷⁻¹⁹ use nutritional supplements of these types. Sport drinks and sport bars/gels are typically used before, during, or after exercise to provide hydration or nutrients. Sport drinks are generally carbohydrate-electrolyte solutions, while sport bars/gels are generally composed of carbohydrate and protein complexes. Meal-replacement beverages are consumed as a substitute for solid food and are usually used for weight control. These products are classified as nutritional supplements because they are labeled as foods (as opposed to dietary supplements that are labeled as supplements) and are subject to FDA regulation as foods.²⁰

An Institute of Medicine report titled "Use of Dietary Supplements by Military Personnel" recognized that a clear picture of use of dietary supplements in the military (eg, prevalence, patterns of use, and AEs) did not exist and recommended conducting surveys to provide detailed information on dietary supplement use by service members.²¹ To this end, previous studies were conducted in Army,¹⁷ Air Force,¹⁸ and Coast Guard¹⁹ personnel. The present study was conducted to complete the survey of military services by assessing the types and number of supplements used, factors associated with supplement use, and the incidence of AEs associated with supplement use in active-duty Navy and Marine Corps personnel.

MATERIALS AND METHODS

This investigation was a cross-sectional survey study conducted among US active-duty Navy and Marine Corps personnel and approved by Naval Health Research Center's Institutional Review Board. Investigators requested information from the Defense Manpower Data Center (DMDC) on a random sample of 4,000 Navy personnel (3,000 men and 1,000 women) and 6,000 Marine Corps personnel (4,500 men and 1,500 women) currently on active-duty and with at least 6 months of service as of February 2014 (10,000 personnel in

total). Data obtained from DMDC included the service member's name, branch of service, pay grade (rank), postal address, e-mail address, sex, age, marital status, education level, and occupation. The National Change of Address records provided by the US Postal Service were referenced to ensure the most up to date postal address was used.

The random sample request to DMDC was based on previous experience with similar Naval Health Research Center's questionnaire investigations indicating an approximate 20% response rate from Navy and Marine Corps personnel²² and statistical power considerations. Minimum sample size was determined with the α -error level set at $\leq .05$, β -error at $< .20$ (power $\geq .80$), using the prevalence of Army supplement use of 53%,¹⁷ and the prevalence of exposure of 0.10. If stratified analyses were conducted on the combined Navy and Marine Corps study population, the minimum sample size required to detect a difference equivalent to an odds ratio (OR) of 2.0 was 784.

Recruitment Procedures

Recruitment of participants in the random sample involved a maximum of six sequential contacts. The prospective participant was first sent an introductory postal letter including information about the purpose of the study, the investigators and their command affiliations, the sponsors, and the reason for conducting the study. The introductory letter provided the service member with a pre-incentive \$10 gift card to nationally available businesses to encourage participation. The letter also included a description of the survey, a link to a secure website, and a subject identification number that could be used to access the survey and electronically sign the consent form. A follow-up e-mail message after 10 days and postcard after 3 weeks were sent as a reminder to those who did not initially complete the survey. If no response was received after sending the postcard, up to three additional e-mail reminders were sent over 3 months, after which contact with the service member ended. Those who responded were sent "thank you" e-mail messages. All postal and online contacts stated that at any time the service member could decline participation and be removed from the contact list. Recruitment began in August 2014 and no further recruitment was conducted or surveys accepted after December 2014.

Survey (Questionnaire) Description

The first section of the questionnaire was designed to characterize participants. Questions included items on demographics (ie, sex, age, height, weight, marital status, and education level), military characteristics (ie, service, rank, occupation assignment, and special operations status), and physical activity (ie, frequency and duration of aerobic and resistance training). This descriptive section was followed by questions about specific dietary supplements, which included 70 generic dietary supplements and nutritional supplements (eg, multivitamins/multiminerals [MVM], individual vitamins and minerals, amino acids [AA], proteins, sport drinks, sport bars) and 111 brand-name products. The brand-name products were similar to those used in previous studies of Army,¹⁷ Air Force,¹⁸ and Coast Guard¹⁹ personnel, but were updated based on a survey of dietary supplement and nutritional supplement inventories in the Navy and Marine Corps Exchange System and General Nutrition

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