

Gender-specific food supplements: do we really need them?

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Abstract. Dietary supplements are needed when nutritional requirements cannot be met through diet alone. The consumption of supplements is generally recommended in the more vulnerable population groups, such as children, the elderly, and pregnant or lactating women. In the general population, by following a diet as close as possible to that recommended by the guidelines it is possible to easily cover the nutritional needs of the body. Therefore, rather than thinking about gender-specific food supplements, we should promote more the adoption of a balanced diet for both sexes. Data on the use of supplements based on gender differences are not very consistent yet.

Key words. Diet, supplements, gender.

Integratori dietetici genere-specifici: ne abbiamo davvero bisogno?

Riassunto. Gli integratori dietetici sono necessari quando le richieste nutrizionali dell'individuo non possono essere garantite attraverso la sola dieta. L'uso di integratori è in genere raccomandato per sottogruppi vulnerabili come bambini, anziani, donne in gravidanza o allattamento. La popolazione generale, seguendo una dieta il più possibile aderente alle linee guida per una alimentazione corretta può soddisfare tutte le richieste nutrizionali dell'organismo. Piuttosto che pensare ad integratori genere/sexo specifici, quindi, bisognerebbe promuovere l'adozione di una dieta bilanciata che risponda alle esigenze energetiche e nutrizionali di uomini e donne. I dati finora disponibili sull'uso sesso/genere specifico di integratori, infatti, per ora non hanno raggiunto evidenze scientifiche significative.

Parole chiave. Dieta, integratori, genere.

Dietary supplements comprise products intended to satisfy nutritional requirements and/or to provide health-promoting features. These products are available in many forms (tablets, capsules, gelatin capsules, soft gels, liquids, etc.) and contain individual components or combinations of dietary elements. Dietary supplements are necessary when nutritional requirements cannot be met through diet alone. The consumption of supplements is generally recommended in the more vulnerable population groups, such as children, the elderly and pregnant or lactating women. However, in

developing Countries, a limited access to a healthful, well-balanced diet can cause micronutrient malnutrition, with irreversible health consequences. Malnutrition occurs when the nutritional requirements for growth are not met, due to an insufficient and/or excessive intake of nutrients. This condition is a public health issue, representing the largest contributor to disease development in both developing and developed Countries.¹⁻³

Nevertheless, the need for dietary supplementation when a sufficient nutritional intake has already been achieved is still the center of vigorous debates, due to the potentially deleterious effects of an excessive intake of some micronutrients which have been identified.

Recent years have seen a boom in supplement use, many of which have become available even in groceries, supermarkets and on the Web. In this regard, it should be underlined that supplements sold online might escape the marketing authorization procedures required by the national and European authorities. Therefore, the huge range of supplements now available makes this area a sort of minefield for consumers.⁴

Nutritional requirements and gender differences

The nutrients we introduce with food do not only meet energy requirements, but also serve important functional and regulatory purposes. Their intake is necessary to allow the exchange of materials and to acquire organic and inorganic substances that our body can use or replace.

In many Countries (including Italy), for every nutrient has been identified the amount sufficient – or more than enough – to satisfy the nutritional needs of people, which is called the *Recommended Daily Allowance (RDA)*. They are an important point of reference when programming diets, both for entire communities and for each healthy individual. In Italy, the Italian Society for Human Nutrition (SINU) developed LARN tables (*Livelli di Assunzione di Riferimento di Nutrienti ed energia per la popolazione italiana*).⁵ These values (amount of calories, proteins, fats, sugars, vitamins, mineral salts) represent the individual daily requirements that should be ensured through nutrition.

The Italian guidelines indicate a percentage of the distribution of calories by macronutrients. Once calculated the individual caloric requirement, the calories to be introduced with the diet should derive from proteins for 12-15%, from lipids for 25-35%, and from carbohydrates for 45-60%.

This distribution is regardless of gender, and is the same for the entire population, with some exceptions requiring different indications and prescriptions (pregnancy, breastfeeding, disease occurrence). What has been proven in numerous studies is that men and women differ as for their basal metabolic rate, which is lower (-5% -15%) in women than men; consequently, they eat different quantities of food: males eat more than females, whatever their age, because they consume more energy than females. Thus, women must eat a lower quantity of kilocalories per day than men. However, the percentage of the different nutrients to be consumed during the day is virtually the same for both sexes. The protein requirement in term of percentage, for example, is the same for women and men but, since it is calculated based on body weight, the quantity in grams of proteins to be consumed daily is lower in women than men. In general, the reference intake of proteins is expressed as g/kg body weight per day or g/d (adjusting for reference body weights). The LARN tables recommend a protein intake of 0.7-0.8 grams per kg of body weight. The difference in body weight determines different values in grams, which reflects the same need in terms of protein requirement. The same is true for fats and carbohydrates, whose nutritional requirements should also be calculated based on age, type of physical activity, type of work, hormonal status, etc.

An adequate intake of micronutrients and other bioactive compounds, like polyphenols, is equally important. These compounds are distributed variously and in different concentrations in food, hence the need for a nutrition as varied as possible in both sexes. However, differences exist between men and women in the requirement of specific micronutrients, depending on the different physiological and hormonal phases. For example, in women (especially those of childbearing age) a higher need for iron than men has been reported, while in men the requirements for zinc and vitamin C are slightly higher than in women.

Gender-specific requirements for individual micronutrients

As previously mentioned, the need for specific micronutrients can vary between men and women, due to the different physiological/hormonal status that they – but women above all – experience during their lifetime, and that might require increasing needs to be addressed by

supplementation. In developing and developed Countries, for example, reproductive-aged or pregnant women should ensure adequate intakes of folic acid, iron, calcium and iodine, which may require supplementation.

Iron is one of the major elements whose need is higher in women than in men, throughout the fertile period, due to their monthly menstrual losses. Iron supplementation is used among women with low hemoglobin and/or ferritin levels during pregnancy, to prevent and treat anemia. It is estimated, in fact, that at least 25% of young European women experience a sub-clinical iron deficiency.^{6,7}

As regards folic acid, the recommendations indicate the same level of intake for both sexes; however, the requirement doubles in women immediately before and during pregnancy. Folic acid supplementation is recommended among reproductive-aged women and during at least the first trimester of pregnancy, to prevent neural tube defects. Supplementation is also required in women on estrogen-progestin therapy, which leads to a reduction in the bioavailability of the B vitamins, of which folates are part.^{8,9}

Iodine supplementation is recommended in areas where iodine deficiency is prevalent, to reduce the risk of congenital hypothyroidism.¹⁰

Increasing the intake of magnesium and potassium in childbearing-aged, pregnant, lactating and peri-menopausal women is equally important.

Calcium requirement can be superimposed in males and females up to menopause, when its intake should increase in women, because of the massive demineralization of the skeleton due to the loss of the protective effect of estrogen on the bone matrix. Calcium requirements also increase in pregnant women and older people. In women of peri-menopausal age, the need for vitamin D increases compared to men. In this phase, the woman tends to gain weight, and the visceral fatty tissue, accumulated on the waist, sequesters the vitamin D, which is fat-soluble and no longer circulates.¹¹

In conclusion, supplementation can play an important role in treating vitamin and mineral deficiencies in specific instances. However, most of the times an improper use of supplements and multivitamins occurs. In particular, multi-vitamin and multi-mineral supplements are very often preferred by consumers also when it would be much more appropriate to take a specific supplement to address a specific deficiency, thus avoiding to consume negligible quantities of different vitamins and minerals that are of little use to the body. In addition, an excessive consumption of vitamins leads to the so-called hypervitaminosis, a condition that sometimes can have very serious consequences. Hypervitaminosis most frequently occurs when consuming an excess of the fat-soluble vitamins A, D, E and K, that are eliminated very slowly and can be stored in the liver and the body fat.

Today on the market there are food supplements specifically addressed to men or women. Food supplements dedicated to women are often characterized by a higher percentage of vitamin D, calcium and iron. For men, bone issues are less frequent, but prostate problems are common, and ingredients such as zinc become important. However, given the minimal differences in the quantities of micronutrients present in those supplements, this mainly seems a marketing operation.

Gender differences in dietary supplement use

A global assessment of the prevalence of dietary supplement use is problematic, due to variations in inclusion criteria, assessment methods, definition of supplement use and the timeframe for data collection. Therefore, most of the available information comes from national surveys, although population-level data are still not available for many parts of the world.¹² The prevalence of dietary supplement use ranges from 22% to 53% in the US, Canada, Korea, UK, Sweden, Germany and France (Table 1). Multivitamins, with or without minerals, are the most frequently used supplements in the US, whereas in Canada, vitamin C is the most frequently consumed supplement overall, and vitamin D is the most common supplement among women; France is an exception, since the same percentage of women and men consume vitamin D supplements. This might be related to the lower nutritional recommendation for vitamin D in France with respect to other Countries, so that women could be less interested in supplementation. In addition, on the French market some products, such as dairy products and breakfast cereals, are sold already fortified with vitamin D, making any further supplementation pointless.²⁰ A comparison of data on dietary supplement use among cohort studies included in EPIC concluded that the frequency and type of dietary supplement vary widely across Countries, and that the prevalence is higher in the Northern regions of Europe than in the South.

Conclusions

Women are more attentive to nutrition, and show healthier dietary habits than men. The differences in dietary choices between men and women can create different nutritional deficiencies. However, care should be taken not to confuse nutritional deficiencies due to an unbalanced diet with particular nutritional needs. By following a diet as close as possible to that recommended by the guidelines it is possible to easily cover the nutritional needs of the body. Therefore, rather than thinking about gender-specific food supplements, we should promote more the adoption of a balanced diet

Table 1. National prevalence of dietary supplement use

Source	Country	Prevalence
Bailey et al, 2011 ¹³	USA	Any F: 53% M: 44% MVM F: 36% M: 31%
Shakur et al, 2012 ¹⁴	Canada	Any F + M: 40% MVM F + M: 28% Vitamin D F + M: 28%
Lee et al, 2009 ¹⁵	Korea	Any F: 32% M: 22%
Lentjes et al, 2015 ¹⁶	UK	Any F: 46% M: 35%
Messerer et al, 2001 ¹⁷	Sweden	Any F: 33% M: 22%
Li et al, 2010 ¹⁸	Germany	Any (regular use) F: 39% M: 29%
Pouchieu et al, 2013 ¹⁹	France	Any F: 46% M: 24% Vitamin D F: 22% M: 25%

F, female; M, male; MVM, multivitamin supplement (with or without minerals).

for both sexes. Supplements can never replace food, in particular fruit and vegetables. Neither can supplement be the alibi to avoid adopting a varied and balanced diet, or being physically active. Scientific evidence supporting the use of supplements is limited to a few diseases, states of nutritional deficiency or increased physiological needs. Data on the use of supplements based on gender differences are still not very consistent.

References

1. International Food Policy Research Institute (IFPRI) [Internet]. Global nutrition report 2014: actions and accountability to accelerate the world's progress on nutrition. Available from: <https://ebrary.ifpri.org/digital/collection/p15738coll2/id/128484>.
2. International Food Policy Research Institute (IFPRI) [Internet]. Global nutrition report 2015: actions and accountability to advance nutrition and sustainable development. Available from: <https://ebrary.ifpri.org/digital/collection/p15738coll2/id/129443>.
3. Rasheed S, Woods RT. Malnutrition and quality of life in older people: a systematic review and meta-analysis. *Ageing Res Rev.* 2013;12:561-6.

4. Dietary supplements 'do not help improve health outcomes'. [Internet]. Available from: <https://www.nicswell.co.uk/health-news/dietary-supplements-do-not-help-improve-health-outcomes>.
5. Società Italiana di Nutrizione Umana (SINU) [Internet]. Livelli di Assunzione di Riferimento di Nutrienti ed energia per la popolazione italiana (LARN). Revisione 2012. Available from: http://www.salute.gov.it/imgs/C_17_dossier_26_listaFile_itemName_0_file.pdf.
6. World Health Organization [Internet]. Guideline: daily iron and folic acid supplementation in pregnant women. 2012. Available from: https://apps.who.int/iris/bitstream/handle/10665/77770/9789241501996_eng.pdf.
7. World Health Organization [Internet]. The global prevalence of anaemia in 2011. 2015. Available from: https://apps.who.int/iris/bitstream/handle/10665/177094/9789241564960_eng.pdf, accessed?sequence=1#:~:text=For%20the%20year%202011%2C%20it,and%2032%20million%20pregnant%20women.
8. Rofail D, Colligs A, Abetz L, Lindemann M, Maguire L. Factors contributing to the success of folic acid public health campaigns. *J Publ Health (Oxf)*. 2012;34(1):90-9.
9. Wolff T, Witkop CT, Miller T, Syed SB. Folic acid supplementation for the prevention of neural tube defects: an update of the evidence for the U.S. Preventive Services Task Force [Internet]. Rockville (MD): Agency for Healthcare Research and Quality (US). 2009; Report No.: 09-05132-EF-1. PMID: 20722169.
10. Zhou SJ, Anderson AJ, Gibson RA, Makrides M. Effect of iodine supplementation in pregnancy on child development and other clinical outcomes: a systematic review of randomized controlled trials. *Am J Clin Nutr*. 2013;98(5):1241-54.
11. Rossom RC, Espeland MA, Manson JE, Dysken MW, Johnson KC, Lane DS et al. Calcium and vitamin D supplementation and cognitive impairment in the women's health initiative. *J Am Geriatr Soc*. 2012;60(12):2197-205.
12. Rautiainen S, Manson JE, Lichtenstein AH, Sesso HD. Dietary supplements and disease prevention - a global overview. *Nat Rev Endocrinol*. 2016;12(7):407-20.
13. Bailey RL, Gahche JJ, Lentino CV, Dwyer JT, Engel JS, Thomas PR et al. Dietary supplement use in the United States, 2003-2006. *J Nutr*. 2011;141(2):261-6.
14. Shakur YA, Tarasuk V, Corey P, O'Connor DL. A comparison of micronutrient inadequacy and risk of high micronutrient intakes among vitamin and mineral supplement users and nonusers in Canada. *J Nutr*. 2012;142(3):534-40.
15. Lee JS, Kim J. Factors affecting the use of dietary supplements by Korean adults: data from the Korean national health and nutrition examination survey III. *J Am Diet Assoc*. 2009;109(9):1599-605.
16. Lentjes MAH, Welch AA, Keogh RH, Luben RN, Khaw KT. Opposites don't attract: high spouse concordance for dietary supplement use in the European prospective investigation into cancer in Norfolk (EPIC-Norfolk) cohort study. *Public Health Nutr*. 2015;18(6):1060-6.
17. Messerer M, Johansson SE, Wolk A. Sociodemographic and health behaviour factors among dietary supplement and natural remedy users. *Eur J Clin Nutr*. 2001;55(12):1104-10.
18. Li K, Kaaks R, Linseisen J, Rohrmann S. Consistency of vitamin and/or mineral supplement use and demographic, lifestyle and health-status predictors: findings from the European prospective investigation into cancer and nutrition (EPIC) - Heidelberg cohort. *Br J Nutr*. 2010;104(7):1058-64.
19. Pouchieu C, Andreeva VA, Péneau S, Kesse-Guyot E, Lassale C et al. Sociodemographic, lifestyle and dietary correlates of dietary supplement use in a large sample of French adults: results from the NutriNet-Santé cohort study. *Br J Nutr*. 2013;110(8):1480-91.
20. Castetbon K, Vernay M, Salanave B, Deschamps V, Roudier C. Dietary intake, physical activity and nutritional status in adults: the French nutrition and health survey, ENNS, 2006-2007. *Br J Nutr*. 2009;102(5):733-43.

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