The role of **vitamin** and **mineral supplements** in health

Roslynn van Schoor

Introduction

The consumption of supplements to promote or maintain health has always been a topic of heated discussion. Are supplements really necessary, or should humans acquire their nutrients through their food only? In truth, most people can reach their micronutrient requirements by following a varied diet. However, there are certain groups of people who require additional vitamins and minerals based on their life-stage or state of health. In these cases, supplements may be beneficial. On the other hand, when supplements are taken by healthy people who do not require additional vitamins and minerals, they could cause toxic effects.

Who needs a supplement?

Pregnant and breastfeeding women

During pregnancy and lactation, a woman's nutrient needs are the highest that they will ever be. In addition to increasing their kilocalorie intake by about 400 kcal per day, pregnant women have an increased need for certain micronutrients. The most important of these include folate, iron, zinc, and vitamin B_{12}. These nutrients all play an important role in supporting a growing foetus.

Folate requirements during pregnancy increase from 400 µg/day to 600 µg/day along with an increase in vitamin B_{12} from 1.3 to 1.9 µg/day. Folate and vitamin B_{12} are crucial in preventing developmental problems and spinal cord defects in the unborn foetus.

Iron requirements rise from 18 to 27 mg/day to compensate for the increased blood volume needed to supply oxygen and nutrients to the foetus. A woman's iron requirements will remain elevated during lactation to replenish iron stores that were lost during childbirth as well as to fortify breast milk.

Although it is possible for pregnant women to meet their increased micronutrient needs by making healthy food choices, it is often necessary to take prenatal supplements. This is particularly true in maintaining health during high-risk pregnancies (e.g. women carrying more than one child). These supplements should contain increased amounts of folic acid, iron and calcium.

Despite the benefits of taking certain supplements during pregnancy, elevated levels of certain vitamins (such as vitamin A) may be toxic and cause harm to both the mother and foetus. It is therefore important for pregnant women to consult a dietician, pharmacist or doctor on which supplements are safe to consume during pregnancy.

Infants and children

During the first year of an infant's life, growth and development occur at a rapid rate. Although growth occurs more slowly after this, the extensive physical changes that take place until early adulthood require adequate nutrients.

In order to grow sufficiently, infants can need up to double the amount of micronutrients an adult would require in proportion to their body weight.

Some of the most important nutrients include vitamins A, C, and D, iodine, calcium and iron. These vitamins and minerals (with the exception of vitamin D) can be obtained from breast milk or from fortified baby formula for the first four to six months.

Thereafter, it is possible and encouraged for children to acquire all their nutrients through a varied diet. The only time infants and children may need additional nutrients in the form of supplements is if they suffer from milk or other food allergies, follow a vegetarian/vegan diet or don't have access to healthy, varied foods. In these cases, supplements containing vitamins A, D, B_{12}, iodine, iron and calcium are often recommended.

Adolescents

As children near their teenage years, their nutrient requirements increase yet again, with iron and calcium playing the most important developmental roles. Males require additional iron during their growth spurts and need an extra 2.9 mg/day to facilitate lean muscle growth. The recommended increase in iron for girls is 1.1 mg/day until menstruation begins, at which time their recommended daily allowance (RDA) rises by 2.5 mg/day.

Both males and females require a higher calcium intake to promote healthy bone growth during their teenage years. In spite of this, the National Health Institute has shown that only 25% of boys and 10% of girls between the ages of nine and 13 reach the recommended 1300 mg of calcium per day. Unless the increased nutrient needs of children and teenagers can be reached through dietary intake, it is recommended that they take a supplement. These supplements may be in the form of a multivitamin, with specific emphasis on iron and calcium.

Adults

Micronutrient deficiency in adults has proven to be an issue in South Africa. Although more common in rural areas, many South Africans are not receiving an adequate intake of vitamin B_1, B_2, B_3, B_6, iron and folate. Lack of a nutritious, varied diet is the root cause of these deficiencies. Supplementation can be used to rectify this problem, but is not encouraged if the RDAs of these nutrients can be met through dietary intervention. It has been shown that individuals following vegetarian/vegan diets often do not achieve an adequate intake of iron, vitamin B_{12}, and calcium, in which case supplementation may be encouraged.

Elderly

As adults grow older, inevitable physiological changes occur. Loss of muscle and a sharp decline in bone mass is characteristic of aging and may increase the risk of falls and bone fractures in older people. While the RDAs of elderly people remain similar to those of younger adults, it becomes more difficult to acquire these nutrients through diet alone. Older people tend to experience loss of appetite and may omit fruits, vegetables and dairy products from their everyday meals. In addition, aging may hinder the ability of the body to absorb essential vitamins and minerals from food.

It is often advised that older people take supplements alongside their diets to maintain their health. Vitamins B_{12}, C and D, folic acid and zinc should make up the bulk of these supplements. Unless taken as a result of disease or injury, it is not advised for older people to take iron supplements. This is because the RDA for this nutrient declines from 11 mg/day and 18 mg/day (for men and women respectively) to just 8 mg/day after the age of 70. Iron supplementation could lead to toxicity which may have severe health implications.

Athletes

Although it is important for highly active individuals to have a healthy intake of micronutrients, additional vitamins and minerals have no effect on performance enhancement. Micronutrients play an important role in the release of energy from fuels, as well as in the transport of oxygen around the body. For this reason, active people are often led to believe that supplements are needed to maintain and promote performance. The only time athletes may need supplements is when they are following restrictive diets, have a low body weight or are experiencing health problems such as anaemia or iron-deficiency. If athletes do choose to take supplements, a multivitamin containing no more than the RDA for individual nutrients is preferred over single-vitamin supplements. Incorrect use of supplements in sport can have adverse effects on the body. For example, supplements containing extremely high levels of vitamin B_3 can cause a painful reddening of the skin known as niacin flush.

Safety of supplements

When taken in excess, some vitamins and minerals can be toxic to the body. Toxicity can have severe health implications that range from skin lesions and digestive problems to organ failure and death. Vitamins which most often impact health when taken in excess include vitamins A, C, D, E, B_3, B_6 and folate. The intake of extra vitamins and minerals may also hinder the effectiveness of certain medications. For example, an increased intake of vitamin K could interfere with blood thinning medicines. Furthermore, almost all minerals, such as iron, zinc and calcium, pose health risks when taken in excess. Most cases of toxicity occur due to excessive consumption of supplements (particularly single-vitamin supplements). For this reason, acquiring essential micronutrients through a varied diet is to be encouraged.

Conclusion

The use of supplements is a double-edged sword. Despite being beneficial when taken at certain life-stages or in times of illness, unnecessary supplementation can cause more harm than good. It is therefore advised to consult a health professional before taking a visit down the nearest supplement aisle.

Bibliography

1. Diet for Healthy Development [Internet]. Healthyeating.sfgate.com. 2017 [cited 10 August 2017]. Available from: http://healthyeating.sfgate.com/diet-healthy-development-5619.html
2. Steyn N, Wolmarans P, Nel J, Bourne L. National fortification of staple foods can make a significant contribution to micronutrient intake of South African adults. Public Health Nutrition. 2007;11(03):1-3.
3. Whitney E, Rolfes S. Understanding nutrition. 14th ed. Stamford: Cengage Learning; 2016; B,C. 455, 477-479, 484-487, 495, 510-513, 520-522, 539-541, 561-566.
4. Denny S. Vitamin needs of athletes [Internet]. www.eatright.org. 2014 [cited 10 August 2017]. Available from: http://www.eatright.org/resource/food/vitamins-and-supplements/types-of-vitamins-and-nutrients/vitamin-needs-of-athletes
5. Vitamin B3 (Niacin)-GH - Canadian Academy of Sports Nutrition [Internet]. Caasn.com. 2017 [cited 10 August 2017]. Available from: https://www.caasn.com/vitamin-b3-niacin-gh.html