

REVIEW ARTICLE

**Popping up a Multivitamin Pill: Should We or Should We Not?**

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**Introduction**

The most frequently asked question by an elderly, health-conscious patient while seeking a physician's consultation is whether he should take some vitamin supplements. There is a myth that taking vitamin supplements makes you feel strong, increases immunity and gives a sense of well-being. There is a galaxy of products containing vitamins and minerals in various combinations easily available over the counter. Dr Casimir Funk who is known as "father of the vitamin" discovered the 'vitamine', a family of organic substances that are essential for life. He postulated that vitamins are vital nutrients which are required in minuscule amounts and revealed that ingestion of polished rice could result in beriberi and proceeded to isolate the anti-neuritic factor of vitamins B1 and B3. Literature in the form of published studies and clinical trials were viewed and effects of consumption of multivitamin and mineral supplements on overall mortality rates and incidence of chronic diseases, particularly cancer, cardiovascular diseases in the form of ischemic heart disease, age-related eye diseases and cognition were studied. The source of information involved extensive search of articles available on internet on the subject and Pubmed database starting from year 2001 till date and the keywords searched were multivitamins, vitamin supplements, micronutrients and mineral supplements. All papers which provided evidence-based inferences of health benefits and health hazards of consumption of multivitamins were included and referred to and articles

which appeared to be industry-driven without any scientific evidence were not considered and referred to.

*Myth or a fact:*

Is it a myth that taking vitamin supplements makes you feel strong, increases immunity and gives a sense of well-being or is it true? There is a galaxy of products containing vitamins and minerals in various combinations easily available over the counter. They are largely propagated, advertised and marketed by pharmaceutical companies and are freely available without even a physician's prescription. Are multivitamin and mineral preparations really helpful and safe when consumed by a healthy individual? One anomaly of both conventional and complementary medicine, has been the promotion of vitamin supplementation even when there is limited evidence of efficacy. For instance, vitamin C has been demonstrated to be a cure for scurvy, but not for the common cold. Linus Pauling, a Nobel prize recipient used mega-doses of vitamin C as cures for cancer,<sup>1</sup> and the common cold,<sup>2</sup> which have not been substantiated.<sup>3, 4</sup> Multivitamin and mineral deficiency generally occurs in adult age group and hence supplementations are used by this population but the potential for exceeding tolerable upper limits of these vital amines should be kept in mind. The question is why multivitamin and mineral products are so widely marketed and

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consumed by almost 40% of the elderly people of the United States? The answer lies in the belief that vitamin supplements have countless benefits in preventing pellagra, rickets, scurvy and if not consumed leads to nutritional deficiencies.

*Why are multivitamins so popular amongst the general population?*

In the United States of America, dissimilar to that in drugs, you need not prove that supplements are secure and efficacious by research on humans.<sup>5</sup> Only if the Food and Drug Administration (FDA) detects that supplements are hazardous, can they stop the dispensation and sale of the products.<sup>5</sup> Also there exists considerably unreliable, deceptive and fallacious advertising in the media, which might be expected given the pharmaceutical industry-driven annual \$27 billion market. There is a general perception and may be it has been ingrained into the people's minds of the by the continuous media bombardment that multivitamin and mineral preparations if not beneficial, will not be harmful, which is why people keep taking these supplements for prolonged periods. Today, most people have become health conscious and want to play a more active and effective role in enhancing their health and expanding their life span. Keeping away from tasty, but unhealthy food, may be a strenuous exercise but taking a pill once a day is trouble-free which is another reason of these so-called 'health pills' being so popular among the 'fitness freaks' and the 'health-conscious' modern, young, workaholic people .

*Proven benefits of intake of vitamins*

Folate supplements during pregnancy significantly minimize the probability of neural tube defects.<sup>6</sup> Iron supplements during pregnancy can considerably decrease the prospects of anemia and perinatal complications in mothers.<sup>7</sup> Calcium supplements are beneficial in patients with osteoporosis.<sup>8</sup> Multivitamin and mineral supplementation can have beneficial effects on subjective stress and mood in healthy adults.<sup>9</sup> Vitamin B deficiency has been associated with increased homocysteine levels,

which sequentially has been linked to a variety of negative neurocognitive and psychiatric consequences in elderly.<sup>10</sup> A link between increased homocysteine levels and depression and a "homocysteine hypothesis" of depression has been put forward.<sup>11</sup> Wernicke Korsakov syndrome is a life-threatening medical condition due to deficiency of vitamin B1 or thiamine.

*How big is the problem of vitamin deficiency?*

It has been estimated by World Health Organization that more than 2 billion people worldwide encounter insufficiency of essential vitamins and minerals.<sup>12</sup> In the United States, vitamins A, C, D, and E and choline, calcium, magnesium, iron, and potassium have been identified as shortfall micronutrients.<sup>13</sup> How frequently are multivitamins and minerals used? More than 50 percent of all adults in the US ingest some form of dietary supplement, with vitamin and mineral supplements making a significant chunk of the total use.<sup>14</sup>

*Why are supplements being used?*

The commonest rationale cited by consumers for consuming multivitamin and mineral supplements were to treat or prevent chronic disease, sustain or enhance overall health, avert health problems and stimulate bone or heart health.<sup>15</sup> Antioxidants such as vitamin C and vitamin E are free radicle scavengers. Free radicals cause cancer and cardiovascular disease by lipid peroxidation and DNA damage. Basic studies suggest that antioxidants prevent the formation of atherosclerotic plaque by hampering oxidation of low-density lipoprotein cholesterol, reducing thrombotic potential and transforming platelet activity and vascular reactivity.

*Who all are the vitamin and mineral supplement consumers?*

People with healthier lifestyles were found to be more apparently destined to use multivitamin and mineral supplements.<sup>15</sup> It was established that supplement users had comparatively more consumption of most vitamins and minerals from their dietary sources than those who didnot use supplements.<sup>16</sup>

*What all does the 'magic pill' contain?*

Multivitamin and mineral supplement 'jumbo-pill' generally contains three or more vitamins, three or more vitamins plus one or more minerals, and upto 9 or 10 total micronutrients.<sup>17</sup> The pills generally contain iron, calcium, magnesium, zinc, vitamins A,C, D and E. The Older Americans Act Amendment of 2006 suggested that the composition contains at least two-thirds of vitamins and essential minerals and provide 100% of the Daily Value for the intended life stage.<sup>18</sup> The health assertions of dietary supplements are regulated by FDA as foods and not as pharmaceuticals.<sup>19</sup> An analysis of National Health and Nutrition Examination Survey (NHANES) has revealed that consumption of highly fortified breakfast cereals can fulfil the deficiencies of micronutrients.<sup>20</sup>

The 2010 Dietary Guidelines for Americans (DGA), issued by the US Department of Agriculture and US Department of Health and Human Services, recommend that *"nutrient needs should be met primarily through consuming foods", but also indicate that "in certain cases, fortified foods and dietary supplements may be useful in providing one or more nutrients that otherwise might be consumed in less than recommended amounts"*

The DGA further enumerated 4 nutrients of importance for adults and children living in the United States: potassium, fibre, calcium, and vitamin D which are generally under-consumed. The DGA also labels folic acid, iron, and vitamin B<sub>12</sub> as nutrients of concern in certain populations; folic acid and iron in women of childbearing age, and vitamin B<sub>12</sub> in men and women over the age of 50 years.<sup>21</sup>

### *Vitamins*

Vitamin E (Alpha tocopherol): Vitamin E is a fat-soluble vitamin and has a major role in cell antioxidant defence system. It can reduce oxidative stress and its supplementation has shown to prevent many chronic diseases.

Vitamin C (L ascorbic acid): Vitamin C accomplishes innumerable physiological functions like antioxidant activity, immuno-

modulation and synthesis of collagen, carnitine and neurotransmitters.

Vitamin A (retinol): Vitamin A is a crucial agent for vision, embryogenesis, integrity of membrane structures, epithelial differentiation, growth, and development.

Folic acid: Folate is a water-soluble vitamin and a member of vitamin B family. It is used for nucleotide biosynthesis, DNA replication, and methylation reactions in body. Folic acid is synthetic folate which is the form used in fortified foods and supplements and is used alone or in combination with other vitamins of B family in therapy or avoidance of cardiovascular disease, macrocytic anemia and neural tube deficiency.

Vitamin D: The effects of calcium and vitamin D are interrelated and hence could not be separated. Vitamin D and calcium intake are important in treatment of osteoporosis.

*What is hidden hunger?*

The idiom "hidden hunger" narrates nutritional deficiencies which arise when people take adequate calories but inadequate micronutrients. "Hidden hunger" is because of eating patterns influenced by energy-dense, but nutrient-poor, foods that are often relatively inexpensive.<sup>22</sup> Most nutrients act in all tissues, and all tissues need all nutrients; therefore, insufficient consumption adversely affects every body system, but with more pronounced effects in some than others.<sup>23</sup>

### *Cancer*

Some trials and meta-analyses have suggested a *growing occurrence* of cancer in relation to certain *individual* vitamin supplements. Long-term use of  $\beta$ -carotene, lutein and retinol has been associated with an increased risk of lung cancer.<sup>24</sup> The randomized Selenium and Vitamin E Cancer Prevention Trial (SELECT) reported that high-dosage vitamin E supplementation was related to a 17% increased risk of prostate cancer in healthy men after seven years.<sup>25</sup> The effects of folate on colorectal cancer risk have had conflicting results, with safeguarding effects shown for dietary folate and

effects ranging from modestly beneficial to adverse effects associated with supplementation with folic acid.<sup>26</sup>

### *Cataract*

Use of high-dose vitamin C or E supplements revealed an *increased* incidence of age-related cataract in a Swedish cohort study comprising of men aged 45 to 79 years. Ingestion of multivitamins only or multiple supplements in addition to vitamin C or E was not associated with cataract risk.<sup>27</sup>

### *Cognition*

In an randomised control trial comprising healthy adults in the age bracket of 18 to 86 years, a supplement pill containing folic acid (400µg), vitamin B<sub>12</sub> (6µg), and vitamin E (30 IU alpha-tocopherol), and S-adenosyl-methionine (400 mg), N-acetyl cysteine (600 mg), and acetyl-L-carnitine (500 mg) improved cognitive function.<sup>28</sup>

### *Conclusion*

Multivitamin and mineral supplements should not be regarded as substitutes for a balanced diet. Dietary supplements should be used as an adjunct to a balanced diet and not as an alternative. A balanced and healthy diet is the best source of vitamins and minerals. A diet comprising of fruit, vegetables, nuts, and whole grains significantly reduce the risk of heart disease, cancer, and stroke. Chief sources of micro-nutrients are plant foods, lean protein foods, and low-fat dairy products.

The results of large-scale randomized trials conclude that there is no overall benefit by consuming multivitamin and mineral supplements. Ironically, some studies indicate increased risk of cancers in relation to using certain vitamins.

Due to the unhindered access of people to vitamins and also lack of knowledge about the ingredients of the available preparations and their doses, it may be highly probable that health-conscious people who take regular vitamin supplements use vitamins in higher doses. Availability of vitamin supplements should be under the control of health

care professionals so that they can advise correctly about the indications and correct dosage to be consumed. Consumption of supplements of vitamin A, C, D, E and folic acid in normal healthy individuals is not always beneficial, and can have adverse effects on health. It is hence recommended to limit these supplements only for those having deficiencies of the mentioned vitamins.

There are particular phases of life when the body requirements for some nutrients increase than the typical diet may deliver, such as iron and folic acid during pregnancy, vitamin B<sub>12</sub> after age 50 years and calcium and vitamin D in osteoporosis and bone diseases. Supplements may be taken in these situations under the supervision of the physician.

### *Competing interests*

The authors declare that they have no competing interests.

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