Journal of Current Pharma Research
(An Official Publication of Human Journals)
An International Peer Reviewed Journal For Pharmacy, Medical & Biological Science
DOI: 10.25166 CODEN: JCPRD6 NLM ID: 101744065
ISSN: Print: 2230-7834 Online: 2230-7842
SJIF Impact Factor: 6.913

Human Journals
Review Article
August 2022 Vol.:15, Issue:3

Should Vitamins Be Treated As Medicines?

Journal of Current Pharma Research
(An Official Publication of Human Journals)
An International Peer Reviewed Journal For Pharmacy, Medical & Biological Science
DOI: 10.25166 CODEN: JCPRD6 NLM ID: 101744065

Jun Kobayashi*[1], Keiichi Ikeda[2]

[1]Faculty of Nutrition, University of Kochi, 2751-1 Ike, Kochi, Kochi 781-8515, Japan; [2]Faculty of Pharmaceutical Sciences, Hokuriku University, Ho 3, Kanagawa-machi, Kanazawa, Ishikawa 920-1181, Japan

Submitted: 20 July 2022
Accepted: 25 July 2022
Published: 30 August 2022

Keywords: vitamin preparation, supplement, deficiency, excess

ABSTRACT

Vitamins are one of the five major nutrients present in food andare ingested through meals. Insufficient intake of vitamins results in deficiency. Currently in Japan, vitamins are readily available as medicines and supplements. However, there are many shortcomings of excessive use of vitamins, and there is a possibility that diseases may occur due to overdosing on some vitamins. In addition, it is thought that in recent years, an environment, dueto which vitamins can be easily obtained, has been created. This paper discusses whether it is necessary to take such vitamins from sources other than meals, such as medicines and supplements. Both insufficiency as well as overdosing of vitamins should be avoided Based on these facts, we will consider the current state of vitamin consumption in Japan.

HUMAN JOURNALS
www.jcpr.humanjournals.com

INTRODUCTION

Vitamins are one of the five major nutrients, along with carbohydrates, lipids, proteins, and minerals[1]. Vitamins are nutrients present in foods and are substances that cannot be synthesized by the human body[2]. They can be absorbed by the body through the consumption of foods and drinks and can maintain and assist in the growth of the body as well as maintain bodily functions and produce energy. Thus, vitamins are naturally present in foods and are absorbed by the body through consumption of meals.

Currently, vitamins are not only prescribed in hospitals as medical drugs in Japan, but are also available as over-the-counter drugs at pharmacies and drug stores. Some items that can be purchased online[3]. Furthermore, supplements containing vitamins are now marketed on a regular basis as healthy foods[4]. Processed foods with a high vitamin content are also being sold by advertising their health benefits. Vitamins are sold as a component contained in several medicines and food items. However, a thought should be given to whether the products containing vitamins are intended to be prescribed for medicinal purposes. In general, medicines should be administered for treatment of diseases and not be used habitually[3]. In other words, we believe that taking them continuously does not serve the purpose of using them as medicines on a therapeutic basis. Although medicines are usually used to treat diseases, they also carry the risk of producing side effects; consequently, the concentrations to be used are often determined judiciously. Vitamin preparations often do not have strict regulations unlike other medicines, such as the purpose for which they should be consumed, and it is thought that vitamin intake is not very effective as a medicine. Based on the above facts, in this review, we have raised the question whether vitamin preparations should be used as medicines.

Effects of vitamins

Table 1 summarizes the types of vitamins, diseases caused by deficiencies of vitamins, effects of overdose of vitamins, and foods in which a particular vitamin is present. Currently, 13 substances are recognized as vitamins. Nine of them are water-soluble and the remaining four are fat-soluble (the four vitamins shown at the bottom of Table 1 are fat-soluble vitamins). However, other subcategories also exist. Depending on the type of vitamin, the residue found at the same position in a compound contained in vitamins may be either an amino group (NH_2), aldehyde (CHO), or alcohol (CH_2OH);the compounds present in vitamin

B_6, are named pyridoxamine, pyridoxal, and pyridoxine, respectively. However, because they all possess the activity of vitamin B_6, they are collectively named as vitamin B_6[1)]. Similarly, vitamin A contains either retinol (the residue is an alcohol), retinal (aldehyde), and retinoic acid (carboxyl group), and vitamin K contains five types, including phylloquinone, menaquinone, and menadione. Some vitamins, for example, vitamin D, become active as a result of being metabolized by the body.

The vitamin content in foods is not necessarily large, and the amount required by the human body is also smaller than that of carbohydrates, lipids, and proteins. This is mainly because, rather than being a component to be used for various reactions in the body, it is often used to regulate these reactions. A small amount is sufficient, and if the intake is too small, it leads to a deficiency. In particular, fat-soluble vitamins have a high residual rate in the body, and excessive intake may easily result in an overdose (toxicosis). This is in contrast to water-soluble vitamins, which are rapidly excreted in urine. However, even water-soluble vitamins consumed in excessive amounts from foods can result in an overdose.

Need for vitamin preparations

Vitamin preparations were originally developed to treat various diseases. It is well known that vitamin $B_1$and vitamin C are antidotes for beriberi and scurvy, respectively[5)]. There are many types of food items available in Japan today, and people can freely choose whatever they wish to eat. Following World War II (around 1945), the country was poor and food was scarce. During that period, there was a lack of knowledge on the nutritional composition of various foods as well as a lack of awareness of balanced and varied intake of ingredients. Consequently, the Japanese people were unaware of the effects of vitamins that they consumed from their meals, and many people suffered from diseases caused by vitamin deficiency. With advances in medicine and pharmacy, the efficacy of vitamin supplementation has become apparent. As a result of progress regarding analysis of components found in many food ingredients, information has spread dramatically that even a healthy individual can ingest vitamins by consuming any type of food. As a result of progress in preventive medicine along with economic prosperity, the concept related to prevention of the onset of diseases by consuming ingredients judiciously so as to maintain nutritional balance is widely known. Such information prevents the occurrence of vitamin deficiencies.

In recent years, this concept has been further developed. As a part of awareness of prevention of vitamin deficiencies, people have begun to think meaningfully regarding the balance of their meals. In addition, the idea of consuming vitamin supplements to compensate for the inability to properly adjust the nutritional balance through diet was born. Medical institutions, such as hospitals, prescribe vitamins whenever an illness occurs, and the concept of vitamin intake through the consumption of natural foods is not taken into consideration. In addition, the fact that vitamins can be purchased at pharmacies without being prescribed by hospitals has also encouraged such behavior. In 1953, multivitamin tablets were released as major over-the-counter drugs to combat vitamin deficiency[5]. Furthermore, the fact that supplements began to be sold at supermarkets and other places also helped people easily obtain vitamins and similar products. Vitamin supplements were originally intended to cure vitamin deficiency and prevent illness; however, people began to believe that it was effective in recovering from fatigue and improving physical strength; therefore, healthy people started consuming them instead of people suffering from illnesses. Later, in 1957, ampule-filled vitamin preparations were released as health drinks, followed by bottled health drinks, and vitamins began to be consumed in the same way as drinking soft drinks. As a result, nowadays, if one wishes to consume vitamins, one can do so easily.

It has recently also become clear that some vitamins have effects other than their original ones. Vitamin B_6, folic acid, vitamin D, and others, are thought to be effective for mental disorders such as attention deficit hyperactivity disorder (ADHD)[6], and there are reports suggesting that they can be used for the treatment of cancer[7].

No need for vitamin preparations

It is said that the boom in the consumption of vitamins and health drinks happened during the 1964 Tokyo Olympics[5]. At that time, American athletes, who were taller and stronger than Japanese athletes, won gold medals one after another, due to which a theory spread that Japanese people were not physically strong because they ate only rice. Rumors also spread that American athletes were healthy and strong because they consumed vitamins. The myth that vitamins were good for the body was established in Japan, and many healthy people began to take vitamins, which were originally prescribed as medicines, on a daily basis[5].

This boom in vitamin intake did not happen only in Japan. The driving force behind the boom in the United States was Dr. Linus Pauling, who won both the Nobel Prize in Chemistry as

well as the Peace Prize. In 1970, he announced that large doses of vitamin C were effective in preventing and treating colds, and in 1979 he gained many followers by claiming that they were also effective against cancer[5),8)]. It has now been scientifically proven that vitamin C does not exhibit such effects. The Nobel laureate's remarks had a great influence on the public at that time, and an increasing number of people continued to take vitamins, believing that it had beneficial effects on health. Currently, 40% of people in the United States are consuming various types of vitamins[5)]. It started with the opinion of one person, and the entire United States was affected by that belief, and Japan was further affected by it.

Many people have continued to take vitamins for several years; therefore, it was possible to verify the effectiveness of vitamins, and negative results have been announced one after another[8),9)]. In a 2005 study of more than 130,000 people, a higher mortality rate was found in people who continued to take vitamin E than in those who did not. A 2008 study of more than 30,000 men reported that vitamin E supplementation increased the incidence of prostate cancer. Examining the overall reports up to 2011, no particular relationship was found between prevention of cancers/cardiovascular diseases and the pattern of intake of vitamin supplements; in other words, the effectiveness of vitamins as a health supplement was not been confirmed[7)]. The current dietary habits of Japanese people show that, except for deficiencies of some vitamins, vitamin deficiencies are rarely found[5)]. It is thought that overdosing on vitamin supplements carries the risk of becoming addicted or leads to the occurrence of some unhealthy conditions.

CONCLUSION

As described above, vitamin preparations were originally developed as medicines and prescribed in hospitals for the treatment of diseases resulting from vitamin deficiencies. In earlier times, vitamins were temporarily consumed to cure physical ailments that specifically occurred due to vitamin deficiencies. However, currently in Japan, vitamin preparations are rarely used as medicines. This is because food is plentiful and there is almost no shortage. Nevertheless, people are likely to be deficient in some vitamins, such as vitamin D[10)]. However, to prevent illnesses, vitamins are regularly used, and many vitamin supplements are taken without taking the amount consumed into consideration. This may be partly due to the fact that vitamin-containing products are readily available in the market everywhere, such as in pharmacies and supermarkets, and this is likely to encourage more and more people to obtain and consume them. In addition, people are likely to be influenced by several TV

commercials on such products[11]. Hospitals and other institutions do not prescribe vitamins unless required to do so. Especially, when you get it outside the hospital, it does not change whether you can buy it depending on the condition of the disease. However, pharmacies sell them very often to customers who comes to buy them. In our view, regular intake of vitamins is not recommended because the risk of disease manifestation due to overdose is higher rather than its benefits.

Although, currently, it is difficult to measure the concentrations of various vitamins present in the body, it is desirable to determine the amount of vitamin intake, if possible. A noninvasive method for measuring the amount of carotene, a precursor of vitamin A, in the blood has been developed, and it is expected that this method will be extended to other vitamins in the future[12]. Regarding the amount of vitamin intake, it is difficult to measure the amount of vitamins present in the food items actually bought. Since, in general, a lot of data on similar types of foods have been published, it is possible to estimate the intake by simply looking up the related information on a smartphone or taking a photo.

Here, we refer to the Cabinet Office's Food Safety Commission of Japan. This committee recognizes that protecting the health of public and ensuring food safety is of utmost importance. It is an organization that is functionally independent from related administrative agencies that manage regulations and guidance of risks related to food safety (Ministry of Health, Labor and Welfare, Ministry of Agriculture, Forestry and Fisheries, etc.), and also conducts objective, neutral, and fair risk assessments based on scientific knowledge. This organization states that basically all substances ingested present risks to health. In addition to the amount and concentration ingested, the frequency of ingestion of foods also affects their ability to cause harm. The Food Safety Commission of Japan states that excessive consumption of all substances, including those corresponding to the five major nutrients, have a risk of being harmful. To obtain some beneficial effects from food items, we should consume them while also considering the accompanying risks involved. If there are little or no beneficial effects, it is better not to consume such foods. The same can be said for vitamins–if you think you are getting enough vitamins from your diet, there is no need to consume extra vitamin supplements. It is more likely that adverse effects will occur rather than beneficial effects. Vitamins are nutrients, and they are substances for maintaining a healthy state; therefore, it is better to live a normally life without being extra cautious regarding the likelihood of suffering from some diseases. Some studies have reported that

consumption of extra vitamins may lead to the treatment and prevention of many diseases; however, there are also research papers that state exactly the opposite. No matter how authoritative and well-known a magazine is, it is necessary to check a large amount of related data and make decisions based on the results. Given the current situation, we believe that it is better to not consume too much of vitamins to avoid the risk of overdosing. In particular, caution should be exercised when taking supplements containing multiple vitamins.

REFERENCES

1) Kuniaki Saito (ed). (2022) Chapter 9 Vitamins. Easy-to-understand Biochemistry, 6th printing of the 5th edition, Nouvelle Hirokawa, Tokyo, pp.172, 173, 178, 179, 198.
2) Jun Kobayashi, Keiichi Ikeda. (2019) The role of meals for the Japanese people in modern times. International Journal of Pharmacy & Pharmaceutical Research, 16, 90-97.
3) Jun Kobayashi, Keiichi Ikeda. (2019) Study on drug classification and relevant professional qualifications in Japan. International Journal of Pharmacy & Pharmaceutical Research, 15, 128-135.
4) Jun Kobayashi, Mamoru Tanaka, Keiichi Ikeda. (2018) Types and problems for healthy foods distributed in Japan. International Journal of Pharmacy & Pharmaceutical Research, 13, 205-212.
5) Hideaki Karaki. (2017) Vitamins do nothing good for the body! Ronza, Asahi Shimbun's Speech Site, published January 24, 2017, https://webronza.asahi.com/science/articles/2017012000001.html (browsed August 2022).
6) Is ADHD caused by a vitamin deficiency? Healthy Pass Blog, published February 22, 2022, https://www.healthy-pass.co.jp/blog/20170126 (browsed August 2022).
7) Cancer Control Research Institute Prevention-related Project, National Cancer Center.
(2011)Vitamin supplement intake and cancer and cardiovascular disease. Multipurpose cohort study,https://epi.ncc.go.jp/jphc/outcome/2809.html(browsed August 2022).
8) Takanobu Nakaseko. (2017) Why aren't vitamins effective, and are they likely to harm your health? Nakaseko Chiropractic Office, published January 7, 2017, https://nakasekochiropractic.com/multivilamindoesntwork/(browsed August 2022).
9) Megumi Tanaka. (2013) Supplements have no effect -A US medical journal slashes. Yahoo!Japan News, published December 20, 2013, https://news.yahoo.co.jp/byline/tanakamegumi/20131220-00030835 (browsed August 2022).
10) Yuji Yamada. (2021) Are Vitamin Supplements Useless? -What is the reality of supplements that lack scientific evidence? Mi-mollet, published December 3, 2021, https://mi-mollet.com/articles/-/33118 (browsed August 2022).
11) Jun Kobayashi, Keiichi Ikeda. (2021) Does the content in commercial messages match the personal views of the celebrities broadcasting them? International Journal of Science & Research Methodology, 19, 125-132.
12) Hiroyuki Suganuma, Hironori Hayashi, Mai Matsumoto. (2022) Development of a device, “Vege-Check”, for non-invasive estimation of vegetable intake. Journal of Japan Society of Nutrition & Food Science, 75, 97-102.

Table 1 Comprehensive information on different types of vitamins

Name (chemical substance)	Deficiency	Overdose	Examples of foods containing large amounts
Vitamin B_1 (Thiamine)	Beriberi, Wernicke's encephalopathy, anorexia, stiff neck	(No report)	Milk, eggs, vegetables, cereals, meat, beans
Vitamin B_2 (Riboflavin)	Cheilitis, angular stomatitis, glossitis, seborrheic dermatitis, growth disorder	(No report)	Milk, eggs, vegetables, meat (liver, kidney)
Vitamin B_6 (Pyridoxine)	Cheilitis, glossitis, peripheral neuritis, anemia, convulsions	Testicular atrophy, (peripheral) sensory neuropathy	Milk, grain
Vitamin B_{12} (Cyanocobalamin)	Pernicious anemia, megaloblastic anemia, chronic fatigue, neuropathy	(No report)	Milk, eggs, meat (liver, kidney, muscle) Synthesized by intestinal bacteria
Niacin (Nicotinic acid)	Pellagra, growth failure, liver dysfunction	Skin redness, digestive system disorders	Milk, eggs, meat, vegetables
Pantothenic acid	Growth failure, dermatitis	(No report)	Liver (chicken, beef, pork, etc.), natto, seafood
Vitamin C (Ascorbic acid)	Scurvy, anorexia, gingivitis	Urolithiasis	Citrus fruits, tomatoes, radishes, green tea
Biotin	Dermatitis, muscle pain, albuminosis, hair loss, anorexia	(No report)	Liver (chicken, beef, pork, etc.), egg yolk, peanuts, royal jelly
Folic acid	Megaloblastic anemia, neuropathy, intestinal dysfunction	Respiratory disorder, dermatitis	Liver, vegetables, wakame seaweed
Vitamin A	Night blindness (light/dark adaptation failure), corneal dryness and malacia, follicular keratosis	Liver dysfunction, hypothyroidism, teratogenicity (pregnant women), increase mortality risk?	Yellow vegetables and fruits, animal products (liver, egg yolk, milk, butter, liver oil)
Vitamin D (Calciferol)	Rickets (children), osteomalacia (adults), osteoporosis (elderly)	Calcification,renal impairment, urolithiasis	Egg yolk, fish oil, mushrooms, liver, butter
Vitamin E (Tocopherol)	Edema, dry skin, red blood cell hemolysis (newborn)	Increased mortality, prostate cancer	Grain embryos, vegetable oils, eggs, vegetables, milk, fish meat
Vitamin K	Neonatal melena, slow coagulation of blood, bleeding	(No report)	Green vegetables, natto Synthesized by intestinal bacteria

Based on data from references 1), 5), 7), 9), 10).