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ADVANTAGES AND DISADVANTAGES OF USING DIETARY SUPPLEMENTS

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Abstract:

Introduction: *Most deaths around the world occur due to non-communicable conditions with the highest rates of non-communicable conditions mortality occurring in middle-income countries and low-income countries, when compared to other countries with high income. The use of nutritional supplementations covers a broad-spectrum of dietary products that are used aiming to provide the body with nutritional support of essential elements. Currently, a wide variety of nutritional supplementations are present in the markets for anyone.*

Aim of work: *In this review, we will discuss the most recent evidence regarding Advantages and disadvantages of using dietary supplements*

Methodology: *We did a systematic search for Advantages and disadvantages of using dietary supplements in the emergency department using PubMed search engine (http://www.ncbi.nlm.nih.gov/) and Google Scholar search engine (https://scholar.google.com). We only included full articles.*

Conclusions: *A well-balanced diet continues to be the ideal approach to maintain sufficient intake of essential micronutrients. However, there are many instances when supplementation has an important role in treating vitamin and mineral deficiencies and insufficiencies. Supplementation for individuals who are already nutritionally sufficient remains controversial; its effectiveness and necessity have been questioned and potential adverse events have yet to be fully assessed. Existing and future trials should carefully monitor both beneficial and adverse effects on different health outcomes.*

Key words: *Advantages, disadvantages, dietary supplements, prevention, treatment.*

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INTRODUCTION:

Most deaths around the world occur due to non-communicable conditions with the highest rates of non-communicable conditions mortality occurring in middle-income countries and low-income countries, when compared to other countries with high income [1]. Therefore, and based on these estimates provided by large studies, it is important to discover, develop, and apply preventive measures and strategies that will decrease rates of non-communicable conditions and their associated mortality locally and globally.

The use of nutritional supplementations covers a broad-spectrum of dietary products that are used aiming to provide the body with nutritional support of essential elements. Nutritional supplementations are often present in several different forms like powders, capsules, tablets, gelatin capsules, liquids, chewing gums, and soft gels. They are used to give individuals their need of a single element or a combination of elements like fatty acids, amino acids, mineral, herbs, and/or vitamins along with other nutritional elements.

The use of nutritional supplementations to provide minerals and/or vitamins is not generally required in a normal healthy adult. However, it becomes essential when the individual cannot meet daily requirement of certain element only through dietary intake. When it comes to patients with nutritional deficiencies, when they receive treatment that allows them to restore needed levels of the deficient elements, it is controversial whether they need to continue receiving the supplements or stop their use. This is important because some elements can have adverse events when their levels become higher than the needs of the body. In fact, a previous systematic review and meta-analysis have investigated this issue and concluded that the use of supplementations of beta-carotene or vitamin E2 in normal healthy adults was associated with higher mortality rates on the long-term. On the other hand, this review could not find negative effects on mortality following long-term supplementations of vitamins A,C and selenium. On the other hand, the USPSTF has released their statement where they concluded that the supplementation of beta-carotene, selenium, folic acid, calcium, and vitamins C,D,E in normal healthy adults who have no deficiencies, was not associated with any beneficial effects regarding survival rates, mortality rates, cancer incidence, and cardiovascular events rates [2].

Currently, a wide variety of nutritional supplementations are present in the markets for anyone. These are claimed to have positive effects on the outcomes of chronic conditions. Many observational studies, in fact, have addressed the benefits of the long term use of vitamin and minerals supplements. However, these observational studies have major limitations including the observational design, the retrospective nature of them, the inability to adjust for all confounding factors, and the absence of proper randomization. Therefore, conclusions of these studies cannot be taken for granted and turned into guidelines. The best way to reach solid conclusions is to conduct clinical trials that do proper randomization and adjust for possible confounding factors, when studying the effects of vitamins supplementations. In this review, we will mostly focus on these trials to reach conclusions regarding nutritional supplementations and their effects on preventing and improving non-communicable conditions and on mortality and survival rates.

In this review, we will discuss the most recent evidence regarding Advantages and disadvantages of using dietary supplements

METHODOLOGY:

We did a systematic search for Advantages and disadvantages of using dietary supplements in the emergency department using PubMed search engine (http://www.ncbi.nlm.nih.gov/) and Google Scholar search engine (https://scholar.google.com). We only included full articles.

The terms used in the search were: Advantages, disadvantages, dietary supplements, prevention, treatment.

Global health challenges:

Both developed countries and developing countries around the world suffer from the increased burden of non-communicable conditions that have become a major concern in health systems. Statistical reports of data around the world show that out of fifty-seven million deaths around the world in the year 2008, thirty-six (about sixty-three percent) were attributed to non-communicable conditions. Of all the deaths of non-communicable conditions, cardiovascular diseases are considered the most common causes and are responsible for about half the deaths. These are followed by malignancies that account for twenty percent of the deaths, then chronic respiratory and pulmonary diseases (twelve percent of deaths) and diabetes mellitus (less than four percent).

The number of deaths that can be attributed to cardiovascular diseases every year is estimated to increase from seventeen million to reach twenty-five million deaths by the year 2030. Similarly, the

number of deaths that can be attributed to malignancies every year is estimated to increase from seven million to reach thirteen million deaths by the year 2030. Of all the deaths that occurred in 2008 by non-communicable conditions, more than eighty percent were reported to happen in middle-income countries or low-income countries. In addition, mortality rates of individuals younger than seventy years old due to non-communicable conditions was significantly lower in high-income countries when compared to middle-income countries. Therefore, providing simple preventive and curative measures against non-communicable conditions is a crucial issue for all countries around the world.

Malnutrition:

The state of malnutrition generally occurs when the dietary intakes of certain nutritional elements do not meet the body needs or exceed the body needs. Malnutrition is considered to be a global major health concern that contributes largely to the development of several conditions leading to significant effects on the quality of life of individuals in both developed countries and developing countries [3].

Currently, reports estimate that more than eight hundred million individuals around the world suffer from chronic malnutrition and nutritional deficiencies. In the year 2013, more than 75% of deaths around the world among infants and children between one to fifty-nine months of age occurred due to both communicable diseases and malnutrition, with more than half of these deaths in this population and in low-income countries occurring due to malnutrition [4].

However, the recent improvements in nutritional status are not equally distributed across the world 6. An important goal of the WHO Plan to prevent and Control Noncommunicable Diseases was, therefore, to increase awareness about healthy diet, with special focus on maternal, infant and early childhood nutritional status and dietary intake [5].

The presence of a Malnutrition status can lead to the development of deficiencies of crucial micronutrients, leading to injuries that are sometimes irreversible. Micronutrient deficiencies affect about two billion people around the world [6]. Anemia is an important and common condition that is related to the deficiency of micronutrients, affecting more than forty percent of children, thirty-eight percent of pregnant females and ninety-eight of nonpregnant females around the world. The commonest etiology of anemia is deficiency of iron (about fifty-percent of anemia cases). Other nutritional deficiencies that can cause anemia include vitamin A deficiency, cobalamin deficiency, folic acid deficiency and riboflavin deficiency [7].

Deficiencies in vitamins and minerals have also been found to be common among the elderly population due to the presence of several predisposing factors in this population — including chewing and swallowing difficulties, loss of sensations and chronic comorbidities — that are superimposed on decreased energy needs and decreased overall intake of calories [8]. In addition, chronic poor choice of food can cause micronutrient deficiencies regardless of individual's age and demographic characteristics.

Prevalence of dietary supplement use:

Worldwide evaluation of the prevalence of use of nutritional supplementation may not be accurate due to the presence of variations in inclusion criteria of patients, methods of evaluation, the definition of supplementations use and the timeline of collected data. Therefore, most current data originates from local surveys, although it should be considered that population-level registries are still not available in many areas around the world.

The prevalence of the use of nutritional supplementations around the world varies between twenty-two percent and fifty-three percent in reports that have been published in the US [9], Canada [10], South Korea [11], United Kingdom, Sweden, Germany and France [12]. Supplementations that included multivitamins with/without minerals were the most commonly used in the United States. However, vitamin C was the most commonly used supplement in Canada, with vitamin D being the most commonly used among females. A comparison of dietary supplement use data among previously published cohort studies concluded that the frequency and type of dietary supplement use varied widely across different countries and that prevalence was higher in regions of north Europe than regions of south Europe [13].

Major chronic disease outcomes:

Noncommunicable conditions like malignancies, cardiovascular diseases, chronic respiratory and pulmonary disease and diabetes mellitus are considered to be the most common causes of death around the world.

Cancer:

Ideal intake of micronutrients might be essential in the prevention of malignancies. This hypothesis has been examined in many clinical trials performed over

the last few decades. However, the perfect timing of starting nutritional supplementation for the prevention of cancer development remains to be not well-understood because malignant tumors usually need several years to completely develop, and interventions with long-term dietary supplement administration are usually very hard to successfully achieve. In fact, for some nutritional elements, excess supplementation can potentially increase the risk of malignancies.

In the year 2013, the USPSTF published a review on the impact of nutritional supplements on the primary prevention of malignancies among healthy adults without the presence of chronic conditions or nutritionals deficiencies at baseline 3. Neither individual supplements (beta-carotene, vitamin E, selenium, vitamin C, folate and vitamin D) nor combined supplements (calcium combined with vitamin D) showed improvements the prevention of malignancies. However, the USPSTF concluded that the current evidence is not enough to evaluate the balance of harms and benefits of using multivitamins supplementation based on evidence originating two large-scale clinical trials. Although these two trials found a decline in the incidence of cancers among adult males, the USPSTF made their conclusion because of the absence of benefits in adult females.

Until now, PHS II is the only large clinical trial that tests a multivitamin supplementation of essential vitamins and minerals at amounts that are similar to the RDA. This study included more than 14,000 male physicians and recorded an eight percent decline in the total incidence of malignancies among those who received a multivitamins therapy every day when compared the placebo group.

This decline in the overall incidence of cancers does not seem to be affected by any individual site-specific malignancies. Additionally, the effect was more potent among males who had a history of a prior malignancy than males without a history of a prior malignancy, with a decline in rates of cancer recurrence that was about twenty-seven percent compared to six percent, respectively [14]. On the other hand, the SU.VI.MAX study did not examine the supplementation of multivitamins but rather used low amounts of ascorbic acid (120 mg), vitamin E (30 mg), beta-carotene (6 mg), selenium (100 µg) and zinc (20 mg) 19. No overall improvement on the total incidence of cancers was found among 13,017 French participants of both sexes. However, a decline in risk 31% was observed in males. The observed decline in risk among males was most significant among individuals with beta-carotene and vitamin C blood levels of less than 0.30 µmol/l and less than 11.4 µmol/l, taking baseline nutritional status into consideration [15].

The Linxian Chinese Cancer Prevention study included more than 29,000 adults from a population with diagnosed subclinical nutritional deficiencies. Low-doses supplementation with beta-carotene, vitamin E and selenium were associated with decreased overall incidence of malignancies by about thirteen percent and incidence of gastric cancer by about twenty-one percent. Therefore, based on this evidence that low doses of vitamins and minerals could prevent the development of malignancies

Despite increasing evidence resulting from observational a study that shows an inverse correlation between vitamin D concentrations and the risk of malignancies[16], no long-term large randomized trials of the use of vitamin D supplementation with cancer as the primary outcome have been fully conducted. A previous systematic review of eighteen controlled randomized trials concluded that the supplementation with vitamin D_3 reduced cancer-specific mortality by twelve percent and vitamin D supplementation decreased all-cause mortality by seven percent among adults. However, only 50,623 individuals were included and significant dropout rates of 3.2% and 3.4% were found in both the active and placebo groups, respectively [17].

No primary prevention trials are currently available for the possible effects of n-3 fatty acids on the risk of developing cancers. However, studies on these compounds for secondary prevention of CVD or among populations at increased risk of CVD have reported no significant impact on the incidence of cancers 32–36. On the other hand, the SU.FOL.OM3 trial raised some concerns about the possible negative impact of n-3 fatty acids on the incidence of cancer among females [18]. To date, VITAL is the only ongoing large clinical trial that is testing the efficacy n-3 fatty acids in the primary prevention of malignancies in the general population.

Prostate cancer:

Supplementation of single vitamins and minerals has been evaluated for the prevention of prostatic cancer, with equivocal results. The SELECT study randomly allocated more than 35,000 males who were well-nourished at the baseline studies to receive selenium supplement (200 µg every day), vitamin E supplement (400 IU every day), selenium plus vitamin E supplement, or placebo, with the incidence

of prostate cancer being the primary outcome; This trial ended early (after 5.5 years of follow-up) due to ineffectiveness of used interventions in decreasing the risk of cancers 38. However, the formula of selenium that was used in the SELECT study has been widely criticized [19]. After seven years of unblinded post-trial follow-up, higher risk of malignancies was observed in the vitamin E supplement group but not in the selenium supplement group of the SELECT study [20].

Colorectal cancer:

Higher doses of single vitamins and minerals supplements have been suggested to have a preventive role of colorectal cancer. In a combined analysis of randomized trials for the secondary prevention of colorectal adenomas, folic acid supplements (0.5–1.0 mg every day) was not associated with prevention of the development of more colorectal adenomas among both sexes [21]. However, folic acid supplement was correlated with significant declines in mortality. When patients were stratified according to baseline plasma folate levels, a statistically non-significant increase in survival rates was observed among individuals with the lowest levels, whereas those with highest levels (>29 nmol/l) showed significantly higher mortality.

On the other hand, in the WAFACS study — a long-term trial of females at high risk of cardiovascular diseases—folic acid supplement, vitamin B6 supplement or cobalamin supplement had no significant impact on the incidence of colorectal cancer or colorectal adenoma [22]. These findings stress on the impact of recording baseline nutritional characteristics into consideration when assessing vitamin and mineral supplements in the prevention of different diseases.

Breast cancer:

Few randomized studies have assessed single or combination vitamin supplements for the prevention of breast cancer. In the WHI, the administration of combined calcium and vitamin D supplement was not associated with changes in the overall incidence of invasive breast cancer in postmenopausal females. In two other separate meta-analyses that included small randomized studies assessing folic acid or beta-carotene supplements, neither of the two reported any statistically significant impact on the incidence of breast cancer [23].

CONCLUSION:

A well-balanced diet continues to be the ideal approach to maintain sufficient intake of essential micronutrients. However, there are many instances when supplementation has an important role in treating vitamin and mineral deficiencies and insufficiencies. Supplementation for individuals who are already nutritionally sufficient remains controversial; its effectiveness and necessity have been questioned and potential adverse events have yet to be fully assessed. Several trials have reported potential adverse events from the use of supplementation with high-doses of beta-carotene and vitamin E, raising some concerns regarding dietary supplementation at much higher levels than the RDA. Therefore, existing and future trials should carefully monitor both beneficial and adverse effects on different health outcomes.

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