

## Vegetarian Diets with Life Style and Nutritional Problems with Nutritional Quality of Foods

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**Abstract:** Vegetarian and vegan diets are becoming more and more popular as the benefits they offer to human health and the environment become more widely recognized. However, even while eating a vegetarian diet has been linked to a lower risk of mortality and chronic diseases, adherents to these diets may not receive enough nutrients, which may limit the positive effects on their health. The nutrients iron, calcium, vitamin B12, vitamin D, iodine, and selenium are the primary ones to be concerned about. Vitamin B12 supplementation is necessary for anyone adhering to a vegetarian or vegan diet. Adults should take one oral dose of 50–100 µg cyanocobalamin daily or two oral doses of 2000 µg weekly to prevent vitamin B12 insufficiency. Supplementing with iodine is advised for vegetarians and vegans who cannot obtain sea vegetables or meals fortified with iodine, as well as for expectant and nursing mothers. For adults, 150 µg of iodine supplements should be taken daily. It is crucial to comprehend the full range of consequences associated with a vegetarian diet, not just the nutritional ones. Studies in this field may help mitigate all variables that could discourage people from adopting a vegetarian diet or negatively affect the quality of life of those who already do so, in addition to providing more consistent data.

**Keywords:** Vitamins, Quality of life, Insufficiency, Nutrition, Vegetarian, Foods, Diet.

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### 1. Introduction:

The concept that giving up meat would make rebirth easier led ancient Egyptian societies to adopt vegetarian diets around 3200 BC. This is when vegetarianism first emerged. This custom has also been linked to the Hindu belief in nonviolence and the sanctity of cows in India, another significant vegetarian hotbed [1, 2]. Vegetarianism declined in the Christian era and only began to regain some traction in the late 18th and early 19th centuries, when Darwin's theory of evolution refuted Church doctrine that held that animals had no souls and that their sole function on Earth was to serve humans [3, 4].

The frequency of vegetarianism now varies around the globe. Asia is the continent where this practice is most prevalent, with 19% of the population following suit. The outcomes of the Asian continent are influenced by India, the nation with the largest frequency in the world (almost 40% of the population) [5]. In Central and South America, the incidence is 8%, whereas it is over 16 percent in Africa and the Middle East. The lowest rates of vegetarianism can be seen in North America, where roughly 6% of people identify as vegetarians, and Europe, where 5% of people follow this diet. Different diets are included in vegetarianism, which is categorized according on how restrictive they are. Although cutting out meat from one's diet is the common definition of vegetarianism, the term can also refer to other less stringent eating habits. These include, for instance, pescatarians, who abstain from all meat save fish and seafood, flexitarians, who occasionally or even weekly consume meat, and organolacto-vegetarians, who abstain from all meat but eat dairy and eggs. Conversely, a rigorous vegetarian diet forgoes any food derived from animals. A strict vegetarian diet and the avoidance of other consumer goods derived from animal products or that depend on animal exploitation, such as clothing and cosmetics, are two aspects of the more expansive idea of veganism [6, 7].

A vegetarian diet can be adopted for a variety of reasons. The primary justifications are ethical ones, which expand on the notion that it is morally wrong to slaughter animals for human use. The health benefits of vegetarianism and their potential are also significant motivators. Concerns about the environmental effects of meat production and religions that promote vegetarianism are also significant factors in the decision to become a vegetarian [8-12]. Vegetarian diets are linked to improvements in classic cardiovascular disease risk markers such blood pressure, plasma lipids, and weight status when compared to omnivore diets [13, 14]. Quality of life (QoL) is a subjective concept that encompasses physical, psychological, social, environmental, and spiritual dimensions, according to the World Health Organization (WHO). Based on data from 12 surveys, a systematic review study evaluated the nutritional quality of vegetarian meals and discovered

that vegetarians had greater levels of nutritional quality than omnivores [15]. As long as they are well planned, vegetarian diets are suitable for all life phases, according to the Academy of Nutrition and Dietetics [16]. Nonetheless, there are steps that must be done to reduce the possibility of dietary deficits.

## 2. Vitamins deficiency:

Cobalamin, another name for vitamin B12, is a water-soluble micronutrient that is only produced by microbes [17, 18]. In addition to being necessary for the methylation processes involved in DNA and cell metabolism, vitamin B12 is also necessary for the development of neural tissue and blood cells [19]. Peripheral neuropathy and megaloblastic anemia are just two of the severe multi-system clinical symptoms that can result from a vitamin B12 shortage. Unusual weariness, tingling in the fingers or toes, impaired digestion, and poor cognition are the main signs of a B12 shortage. Even though subclinical vitamin B12 insufficiency can cause stroke, dementia, and poor bone health over time, people with low vitamin B12 consumption may appear healthy at first.

Foods derived from plants are practically devoid of vitamin B12 because sanitization procedures eliminate microorganisms that produce B12 [20]. However, because livestock need vitamin B12 to maintain their health and are exposed to it through various sources throughout their lives, such as faeces, feed contaminated with B12-synthesising microbes, feed containing animal-sourced foods, and B12 supplements, the vitamin accumulates in animal produce, such as meat, dairy, and eggs [21]. It's important to remember that red meat and processed meat do not always provide safe B12 sources. Hence, it is imperative that those adhering to plant-based dietary regimens that prohibit animal products incorporate a dependable supply of vitamin B12 into their meals, such as B12 supplements and foods fortified with B12. It's crucial to remember that serum vitamin B12 is not a reliable indicator of vitamin B12 deficiency; a person can be deficient in vitamin B12 even while their blood concentration is normal. As a result, the true frequency of vitamin B12 deficiency in vegetarians is probably higher than what this research indicates.

Maintaining appropriate serum calcium and phosphorus concentrations is one of vitamin D's primary activities in the human body. This supports transcription control, bone metabolism, and a number of other metabolic processes [22]. Over the past few decades, the known biological significance of vitamin D has increased dramatically. Vitamin D metabolites are now known to be able to trigger physiological reactions in over 36 different types of cells [23]. As a result, vitamin D may have an impact on several systems, providing a wide range of functions in maintaining health. Numerous unfavorable health outcomes, such as rickets, osteomalacia, certain malignancies, cardiovascular disease, type 2 diabetes mellitus, autoimmune illnesses, neurological disorders, poor pregnancy outcomes, and mortality, have been related to vitamin D insufficiency and deficiency. Additionally, there are a number of accessibility obstacles that keep certain segments of the world's population from getting enough sunlight. An individual's capacity to generate sufficient amounts of vitamin D from sunshine is influenced by various factors such as skin pigmentation, use of sunscreen, season, latitude, altitude, and air pollution. An estimated 20% of vitamin D is obtained by diet, and the remaining 80% is obtained through sun exposure [24].

A tiny bit of research suggests that vegetarians have greater rates of vitamin D insufficiency and deficiency than omnivores, as well as inadequate dietary intake of the vitamin. Bakaloudi et al. [25] conducted a systematic review of vegans' nutrient intake and discovered that vegan diets were linked to lower vitamin D intakes than reference intake values or lower intakes than omnivorous and other vegetarian diets (based on 11 studies with a total of 4703 participants). Ho-Pham et al. [26] discovered in a cross-sectional analysis of 210 postmenopausal Asian women (105 omnivores and 105 vegans) that omnivores had considerably greater plasma 25-hydroxyvitamin D concentrations than vegans. This conclusion is consistent with the findings of the previous study. The prevalence of vitamin D insufficiency was 73% in vegans and 46% in omnivores, while the prevalence of vitamin D deficiency was 27% in vegans and 6.5% in omnivores, based on plasma 25-hydroxyvitamin D concentrations <30 ng/mL and <20 ng/mL, respectively, as the cut-off values [27]. Vegetarian and vegan diets are frequently linked to poor bone health, which may be partially explained by the higher rates of vitamin D insufficiency and deficiency seen in vegetarians compared to meat eaters. In comparison to omnivores, vegetarians and vegans have reduced bone mineral density around the femoral neck and lumbar spine, according to a 2019 meta-analysis involving 20 trials and 37,134 participants [28].

One vital micronutrient required for the production of thyroid hormones is iodine. Three (T3) or four (T4) iodine atoms are attached to two linked tyrosine molecules to form triiodothyronine (T3) and thyroxine (T4) [29]. Growth, brain development, and metabolism are all regulated in significant ways by thyroid hormones [30]. Iodine deficiency diseases (IDDs) are the collective term for a number of harmful health outcomes linked to iodine deficiency. These include endemic cretinism, hypothyroidism, goitre and its aftereffects, and mental impairment [31]. The total iodine content of 250 mL of cow's milk is about 110 µg, which contributes significantly to the adult daily iodine consumption requirement of 150 µg/d recommended by the Institute of Medicine. Iodine concentrations in plant-based milk substitutes that have been fortified are comparable to those in cow's milk; yet, a review of 47 plant-based milk substitute products available in the UK showed that just 6.4% of them had been fortified [32].

In 2021, a systematic review of eight research involving 1890 participants revealed that vegans' iodine consumption was significantly lower than nonvegans' and often lower than the recommended daily allowance of 150 µg [25]. A comprehensive analysis of research evaluating the iodine status and intake of persons adhering to vegan and vegetarian diets was released in 2020 [33]. A total of 127,094 individuals and data from 15 articles were taken into account. According to the study, omnivores were found to have the highest iodine consumption in 83% of trials, while vegans tended to have the lowest intakes. Additionally, the vegan diet group did not reach optimum status and had the lowest median urine iodine amounts. Vegetarians exhibited median urine iodine values that were greater than those of vegans, but lower than those of omnivores.

Sea vegetables, iodized salt, plant-based milk substitutes supplemented with iodine, and iodine supplements are the easiest ways for vegans to meet their iodine needs. Those who choose sea veggies should be aware that consuming too much iodine can cause hyperthyroidism [34]. An iodine supplement should be used if fortified plant-based milk substitutes and iodized salt are unavailable, as well as if frequent eating of sea vegetables is not feasible. Regardless of their diet, health organizations like the American Thyroid Association and the American Academy of Paediatrics advise women who are contemplating a pregnancy, are already pregnant, or are nursing to take a daily supplement containing 150 µg of iodine.

The most common mineral in the human body is calcium, which makes up 2% of the average adult's body weight [35]. Body fluids and soft tissues contain only 1% of the total calcium, with the remaining being retained in bones and teeth [36]. To reach maximal bone mass and promote bone growth, calcium is necessary along with potassium [37]. Low bone mineral density from inadequate calcium consumption can raise the risk of osteoporosis later in life. Vegans may run the danger of not getting enough calcium in their diets. A total of 6376 people were included in 14 research that examined calcium intake and dietary choice, according to Bakaloudi et al. [25]. All of these research combined demonstrated that vegans consumed less calcium than non-vegans. Furthermore, 76% of vegan diet adherents did not meet the WHO RNI for calcium. In 2022, a meta-analysis comprising 74 studies and 166,877 participants revealed that vegans consumed significantly less calcium than vegetarians and omnivores combined [38]. Vegans should focus on consuming foods high in bioavailability and rich in calcium. The bioavailability of calcium in plant-based diets is highly varied because of the presence of chemicals that hinder absorption, such as oxalic acid and phytotic acid. While many green leafy vegetables (including spinach and Chinese spinach) are high in calcium, they can also be high in oxalic acid, which lowers the calcium bioavailability to roughly 5%. Before considering supplements, vegans with low calcium status should try to address the issue by increasing their intake of foods that are high in calcium, such as plant-based meals that are fortified with calcium. This is because supplements have been linked to an increased risk of cardiovascular events [39].

### 3. The Quality of Life of Vegetarians:

The impact of a vegetarian diet on runners' QoL (quality of life) was evaluated in a cross-sectional study. A convenience sample consisting of 281 individuals—158 vegetarians and 123 omnivores—was chosen from German-speaking nations, specifically Germany, Switzerland, and Austria. The WHOQOL-BREF was the tool used to evaluate the quality of life of the study participants; it was administered digitally. The findings demonstrated that there was no difference in QoL scores across groups and that all participants, irrespective of the diet type, scored highly. Consequently, it was determined that runners have high QoL levels and that, for this particular population segment, a vegetarian diet was just as beneficial as an omnivorous diet [40]. In Brazil, a specific questionnaire to evaluate the QoL of vegetarians was developed and validated, since other studies used only general questionnaires or others that were not specific to vegetarians [41]. Vegetarians have satisfactory levels of quality of life, according to the responses (average scores between 70 and 80 on a 100-point scale). Vegans had the greatest marks among the various categories of vegetarians.



Figure 1: Safety rate identified for some selected foods

A vegetarian diet and a typical type 2 diabetes treatment diet were evaluated for their effects on patients' quality of life and eating habits in a clinical experiment. The Obesity and Weight-Loss QoL questionnaire (OWQOL) and the Weight-Related Symptom Measure questionnaire (WRSM) were used to measure QoL. Both diets improved QoL and mood, but the effect was greater in the vegetarian diet group, showing that type 2 diabetic patients may benefit from such a dietary pattern not just for their physical health but also for their mental well-being [42].

A study by Barnard, Scialli, Bertron, Hurlock, and Edmonds evaluated women's acceptance of a low-fat vegan diet in the United States. In a crossover design, 35 nonmenopausal women were split into two groups for the study: one group followed the diet for a duration equal to two menstrual cycles, while the other group did not follow any diet at all. The low-fat vegan diet was well accepted and had excellent adherence, but the participants said it took more work to stick to the diet. Along with better sleep, digestion, and vitality, they also reported losing weight, all of which can enhance quality of life [43].

#### **4. A Management Approach to Preserve Foods' Nutritional Density:**

Conventional fruits, vegetables, and foods have historically had different nutritional qualities; this has been made more evident by issues in nations where micronutrient deficiency is common. Reviving traditional food crops, managing soil nutrients, switching to organic farming, increasing soil microbial diversity, and biofortifying food crops are some of the suggested strategies to lower malnutrition. Community nutrition programs should pay attention to the whole diversity of nutrients that may be deficient through food-based approaches, since they are currently focused on an especially insufficient range of micronutrients, such as iron, iodine, and zinc. Instead of focusing just on one nutrient at a time, as is the current strategy of bio-fortification initiatives, plant breeding should aim to increase the store of vital nutrients and minerals. It is necessary to provide farmers, agriculture scientists, and other stakeholders in the food system with useful knowledge in order to restore the nutritional quality of fruits, vegetables, and food crops.

Research on the genetic dilution impact should be conducted in conjunction with field studies evaluating the nutritional content of contemporary and historic cultivars. It is still necessary to conduct long-term studies comparing food crops cultivated organically and conventionally, using established procedures. Possible strategies to counteract the nutrient dilution effects of fruits, vegetables, and food crops under changing climate conditions include dietary diversification, micronutrient supplements [44, 45], improving the nutritional quality of food, bio-fortification, managing soil fertility including plant-breeding techniques [46], encouraging natural farming, bringing back traditional foods [47], producing nutrient-intense underutilized fruits and vegetables [48], encouraging beneficial soil microbial inoculation, and preserving soil biodiversity [49, 50].

#### **5. Suggestions:**

Switching to a vegetarian diet can improve each of the four (quality of life) QoL categories. The physical domain is positively impacted by reduced noncommunicable disease rates and improved health outcomes. Positive emotions brought about by doing good deeds, as well as a sense of community or closer ties to the vegetarian community, have a beneficial impact on the social and psychological domains, respectively. Lastly, the environmental domain benefits from vegetarian diets because they have a lesser environmental impact. A non-balanced vegetarian diet can result in nutritional deficits that would be harmful to health and impact the physical realm, even though overall health would be improved. Since vegetarians are still a minority, stigmatization and rejection from non-vegetarians could negatively affect vegetarians in society. A vegetarian diet may have unknown psychological and mental impacts, yet some research suggests that there may be a higher risk of depression.

The choice to become a vegetarian or not can also be influenced by a number of factors from other QoL categories. One of the main reasons to try a vegetarian diet is to improve one's health. Adopting a vegetarian diet can be motivated by a desire to lessen one's environmental effect as well as psychological factors such as ethical/moral, religious/spiritual, and other factors. Another factor that can lead someone to become a vegetarian is joining a social group and feeling like they belong. Lastly, since adopting a different eating pattern partly depends on contextual factors like food availability and economics, people who live in areas with limited access to plant-based food sources may find it challenging to switch to a vegetarian diet.

#### **6. Conclusion:**

The traditional benefits of vegetarian and vegan diets in preventing non-communicable diseases may be limited due to a number of nutritional deficiencies linked to these dietary approaches. As a result, careful preparation is needed to guarantee that these diets are nutritionally sufficient. Although foods fortified with vitamins and minerals are a helpful tool, not all populations can obtain them, so vegetarians and vegans should establish a proper supplement regimen. We must keep an eye on these diets' nutritional characteristics, especially as creative meat and dairy substitutes gain popularity. It's necessary to comprehend the full range of consequences associated with a vegetarian diet, not just the nutritional ones. Studies in this



field may help mitigate all variables that could discourage people from becoming vegetarians or negatively affect the quality of life of those who already do so, in addition to providing more consistent data.

**Competing interest:** None.

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