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Review Article / Derleme

Evaluation of vegan nutrition in regards to health

Vegan beslenmenin sağlık açısından değerlendirilmesi

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ABSTRACT

Veganism is refusing to use any animal food, clothing, and other products. In other words, veganism is a strict form of vegetarianism. Veganism is avoiding all food of animal origin including dairy products and egg. Vegan diet increases over the past decades. Adequate and balanced nutrition is possible with a well-planned vegan diet in every stage of life (childhood, pregnancy, adulthood etc.). Vegan diet consists of grains, legumes (including soy and derived products), fruit and vegetables, nuts and seeds, vegetable oils, herbs, and spices. Plant-based food are proved to be healing and protective for health. However, avoidance of animal products may lead to some nutrition deficiencies. In order to avoid health problems in vegan fed individuals, they should be informed and guided. The aim of this review is to examine the literature on vegan nutrition and health effects. The titles mentioned in the review emphasized the importance of nutrients in vegan individuals. The nutritional elements that are mostly observed to be deficient in vegan individuals whose diet is very restricted and not designed well are iron, vitamin D and B_{12}, calcium, zinc, omega-3-fatty-acid. It is widely known that chronic nutrient deficiency may lead to a variety of health problems. Nevertheless, it is possible to avoid these deficiencies if plant-based nutrition is adequate and balanced. Vegan diets that restrict calorie-intake, quit one or more food group, inattentive to crucial nutritent cannot be accepted as balanced and could lead to serious health consequences.

Key Words:
Vegan, Food, Diet.

Anahtar Kelimeler:
Vegan, Besin, Diyet.

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ÖZ

Veganizm hayvansal besinleri, giyecekleri ve diğer tüm yan ürünleri kullanmayı reddeder. Veganizm sıkı vejetaryenlik olarak da adlandırılabilir. Vegan beslenme ise yumurta, süt ve ürünleri de dahil olmak üzere hayvansal besinlerin tamamından kaçınmak olarak tanımlanabilir. Son yıllarda vegan beslenme giderek artmaktadır. İyi planlanmış vegan beslenmeyle çeşitli bitkisel kaynaklı besinler tüketerek yaşamın her evresinde (çocukluk, gebelik, yetişkinlik vb.) yeterli ve dengeli beslenmek mümkündür. Vegan diyet tahıllar, baklagiller (soya ve türevleri dahil), sebze ve meyveler, sert kabuklu yemişler ve tohumlar, bitkisel yağlar, otlar ve baharatlar gibi çeşitli bitkisel kaynaklı besinleri içerir. Bitkisel kaynaklı besinlerin sağlığı iyileştirici ve geliştirici olduğu kanıta dayalı verilerle vurgulanmaktadır. Ancak hayvansal kaynaklı ürünlerin tüketilmemesi bazı besin eksikliklerine yol açabilir. Vegan beslenen bireylerde sağlık sorunlarının görülmemesi amacıyla bu bireylerin bilgilendirilmeleri ve yönlendirilmeleri gerekmektedir. Bu derlemede amaç vegan beslenme ve sağlık etkileriyle ile ilgili literatürdeki verilerin incelenmesidir. Derlemede belirtilen başlıklar vegan bireylerde besin ögelerinin önemini vurgulamıştır. Dengeli planlanmamış veya çok kısıtlı şekilde beslenen vegan bireylerde en sıklıkla eksikliği görülen besin ögeleri demir, D vitamini, B_{12} vitamini, kalsiyum, çinko, omega 3 yağ asitleridir. Kronik hale gelen besin ögesi yetersizliklerinin çeşitli sağlık sorunlarına yol açabileceği bilinmektedir. Bitkisel kaynaklı beslenmenin yeterli ve dengeli seçilmesi ile bu eksikliklerden korunmak mümkündür. Enerji alımını kısıtlayan, bir veya daha fazla besin grubunu tüketmeyen, kritik besin ögelerine dikkat etmeyen vegan diyetler dengeli kabul edilemez ve sağlık açısından tehlikeli sonuçlar doğurabilir.

INTRODUCTION

We can define veganism as people who do not consume selected animal foods (meat, poultry, fish, eggs, milk and dairy products) or any kind of product including those to which animal ingredients are added and additives are completely avoided. Vegetarianism is a diet that includes consuming mostly plant-based foods while the vegan diet is a hard vegetarian diet. Vegan diet is strictly restricted to the consumption of plant-based foods (1, 2). Vegans even reject honey, gelatin obtained by boiling bones, chocolate because it contains milk and daily use products made from animal body parts like fur and leather (3). Veganism is gaining popularity around the world day by day (4-6). Recently vegans make up 1% of the total population, however increases over the past decades and can be a result of ethic, health, or environmental concerns (7). In addition statistics shows that sales of plant-based foods (e.g. convenience

food prepared as vegan options) have increased strongly over the past years (8 , 9). Guidance is important for vegans to avoid health problems so in this review, the aim is to examine the literature on vegan nutrition and health effects.

VEGAN DIET TYPES

Vegans are divided into 3 sub-groups (3): Zen macrobiotics diet, rawists, frutarians.

Zen Macrobiotics Diet

Zen Macrobiotics diet occurs legumes, grains, fruits and vegetables. Some of the vegans who applies zen macrobiotics diet are fed just with grains, excluding fruits, vegetables and legumes from their diet (10).

Rawists

They do not prefer cooked food. These people think that the nutrients of the food will be lost if cooking . They generally consume raw fruits, vegetables, nuts, seeds, legumes, grains. And also they eliminate harmful category of food like processed foods (3, 11).

Fruitarians / Fruit-fed / Fruitists

Fruits and nuts are included in this diet, also sometimes it might include vegetables that only counts as fruit in the sense of botany. (12). Nutrient deficiencies (especially protein) may seen in vegans who follow this diet (3).

HEALTHY DIET FOR VEGANS

Dietary guidance statements on vegan diets have been published by a lot of health professional organizations. Vegan diets should be planned carefully and they should be able to provide adequate nutrition throughout life when relied on a wide range of plant-based foods (13-15). Even though it was doubtful to be vegan during, infancy, childhood pregnancy and breastfeeding in the past, nowadays it is known that adequate and balanced nutrition is accomplishable with well planned vegan diets. This is also valid for athletes. Contrary to emphasis on vegan diets to be deficient in nutrition, they are rich in a wide variety of foods: grains, legumes, soy and derivatives, vegetables, fruits, nuts and seeds, vegetable oils, and herbs and spices (16, 17). Food diversity should be provided for absorbing all nutrients into the body. However, nutrients consumed on a vegan diet are not healthful on some occaions. For example, vegans can consume plant based foods with high ammount of sugar, salt or unhealthy fats. Therefore, for a vegan diet to be healthy, it should be supported by experts (18). Consuming adequate amounts and various plant foods, emphasizing the intake of mainly unprocessed or minimally foods: a vegan diet can be nutritionally sufficient while supplying the calorie requirements from a variety of nutrient-dense foods (13).

REMARKABLE NUTRIENTS IN VEGANS

It has been shown that vegan diets are beneficial particularly in increased fiber, beta carotene, vitamin C and K, folate, magnesium and potassium intake and so it is a high quality diet (19). Despite these benefits, the risk of energy and nutrient deficiencies is the main criticism of plant-based diets (20).

MACRONUTRIENTS

Since there is more dietary fiber in vegetable foods and more water content in fruits and vegetables, there are low calories in unit volume (21). However well planned vegan diet can fulfill the macronutrient, which provide energy, requirements.

Carbohydrates

Plant-based diets are rich in carbohydrate sources. Studies showed that the carbohydrate intake ranges daily energies of vegans from 50% to 65% while omnivours in the general population have an intake of 50% or less (22, 23).

Proteins

Recent studies show that the protein ratio of daily energy intake is higher in ominovours than vegans. (24). However, a vegan diet that well planned can supply the need of protein generally (4). Protein intakes should be increased by 10% of energy in vegans (25). In fact, amino acids determine the quality of protein. All essential amino acids can be found in plant proteins (26). Thus, while according to a study, it is not necessary to combine different protein sources at each meal if various plant foods consumed during the day (4), other studies indicate that consuming grains (methionine) and legumes (lysine) together provides more benefits for the bioavailability of essential amino acids. (27, 28). The amino acid profile of soybeans is very similar to egg albumin. Soy and derivaties are an important source of protein in this diet (21). Vegan diets supply the protein requirement with nuts, grains, seeds, legumes, green leafy vegetables, pseudocereals (buckwheat, quinoa, and amaranth), especially soy and derivaties (26, 29).

Studies have found that cooking legumes can reduce tannin levels and trypsin inhibitors while making protein more available. Whole grains have higher than refined grains protein bioavailability (30-32). Thus, cooking legumes and adding whole grains to vegan diets can contribute to well-planned diet.

Fats

Fats provide the most intense energy to the body amongst macronutrients. Vegan diets may contain good sources of polyunsaturated fats. Omega-6 (ω-6) and omega-3 (ω-3) cannot be produced by the human body so they must be contained in the diet (33). Plant-based diets are normally abundant in ω-6 fatty acids (34).

Long-chain ω-3 fatty acids have major importance for the health of the retina, brain and cell membranes. ω-3 may affect pregnancy outcomes and decrease the risk of chronic diseases. The best plant sources of ω-3 fatty acids are flax, hemp, chia, canola and walnuts. Vegan diets contain higher amount of a-linolenic acid (ALA) than animal-based diets (35). Plant-based diets contain less bioavailable ω-3 fatty acids that's why they need well planning (36).

ω -3 is found in vegan diets as ALA. Vegans intake of ALA is alike to omnivorous, meanwhile ω-3 fatty acids, eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) are not taken in the plant-based diets. ALA is more easy to convert to EPA, while DHA needs retroconversion process for converting to EPA. So vegans should take an algae-based DHA dietary supplement in addition to regular dietary intake of ALA sources (37).

Vegan diets should contain approximately 5% to 6% of daily energy from saturated fat like mostly tropical fats or high-fat foods. This amount is recommended by American Heart Organization (38).

MICRONUTRIENT S

Vitamins and minerals include elements required in small quantities for general health (13). Vegans remove all animal-based foods from their diet and as a result, significant micronutrient deficiencies can be increased (39).

B_{12} (Cobalamin)

Vitamin B_{12} also called cobalamin and plant-based foods does not contain it. Plant-based foods are unsufficient or unpractical sources of this vitamin (40). Even they have B_{12} it's form is unusable in human body. If vegan diets include neither sufficient intake nor vitamin B_{12} supplements may result in vitamin B_{12} deficiency in the long term. Even though lack of B_{12} intake may not cause people to feel unhealthy in the short-term, subclinical deficiency can lead to malabsorption, osteoporosis, mental illness, stroke, dementia in the long-term. Vitamin B_{12} is contained in the metabolism of all cells and is critical for DNA synthesis (41). Vitamin B_{12} deficency causes megaloblastic anemia and peripheral neuropathy. Vitamin B_{12} is a coenzyme for two enzyme-catalyzed reactions in the body.

B_{12}-fortified foods for vegans are sometimes suggested to provide vitamin B_{12}. However, such products are sometimes hard to reach, and also they should be consumed three times a day to supply sufficient vitamin B_{12} (20). Thus, supplementation is the best way for all vegans to fulfill their B_{12} requirements.

Iron

Animal foods contain iron in heme form and plant foods contain iron in non-heme form. While bioavailability of heme form is 15-35%, that of non-heme form is 1-34% (15, 42).

On the contrary, just the absorption of non-heme iron plays a role on homeostatic regulation, which may preserve plant-based eaters from overload of iron, a risk factor for cardiometabolic diseases.

Non-heme iron absorption might be influenced by cooking methods and nutrition plan (43). Organic acids like vitamin C, carotene and vitamin A rise the bioavailability of non-heme iron.

Fermentation, germination, sour leavening, soaking beans and grains all rise non-heme iron bioavailability by decreasing phytates, which are iron absorbtion reducers like tea (15).

Vitamin D

Most of the necessary amount of vitamin D is provided by sun exposure and the remaining need for vitamin D is produced by nutrition. Vitamin D deficiency is common among vegans because vitamin D intake is mostly from animal-based foods (44, 45). Vitamin D affects bone metabolism. It is been reported that some vegans have vitamin D deficiensies, specifically when the blood test was made in the winter and in those living near poles. Dietary and supplemental resources of vitamin D are generally required to fulfill the needs of this vitamin. Vegan diets that are fortified with vitamin D include breeakfast cereals, fruit juice, margarins. (46, 47). Mushrooms that are treated with ultraviolet light can be important resources of vitamin D (48).

While yeasts that are treated with ultraviolet light produce Vitamin D_2 (ergocalciferol). Vitamin D_2 and vitamin D_3 appear to be equivalent at low doses, however vitamin D_3 appears to be more effective than vitamin D_2 at higher doses. Vitamin D supplements are recommended, if sun exposure and intake of fortified foods are inadequate to meet needs (45).

Calcium

Calcium requirements can be supplied in a vegan diet by some plant foods, tap water and calcium-

rich mineral water (15). Calcium absorption and bioavailability are restricted, because plant-based calcium is bound to oxalate. Therefore, supplementation is often recommended (21).

Zinc

Plant foods are important sources for zinc. Some of these sources are grains, soy, legumes, nuts, seeds and especially nutritional yeast which is commonly used by vegans. Experts advise vegans to determine 50% or greater than the recommendation of daily zinc consumption. Preparation methods and vitamin C will enhance absorption (49, 50).

Iodine

Iodine provide controlling blood circulation and metabolic rate. Vegans can obtain their iodine need from plant-based foods like sea vegetables or iodized salt (13, 51).

Fiber

Since the presence of adequate fiber groups (whole grains, legumes, vegetables and fruits etc.) in the vegan diet increases fiber consumption which might exceed daily need. An excess of fiber, can result in restricting food and daily calorie intake and also may cause deficiencies in micronutrients by reducing the absorption of some of them from the intestines (52, 53). Therefore, vegan diets should be well planned.

HEALTH EFFECTS OF VEGAN DIET

The studies indicated that vegans ate the high dietary fiber, the low total fat and saturated fat, and had the more healthy body weights (54), low blood sugar (55), low cholesterol levels (56), low blood pressure levels (57) compared to omnivores. Plant-based diet is a protective against inflammation and so can reduce the risk of many chronic diseases and mortality (58, 59). Also a plant-based diet seems to be healtful by supporting the development of a more various gut microbial system (60, 61). Therefore plant based diet reduce the risk of gastrointestinal diesease. Nevertheless, lack of vitamins D and B12 have been related to low bone mineral density, increased fracture risk, and osteoporosis (45).

CONCLUSIONS

The number of individuals who adopt a vegan diet that aims to eat only by consuming plant sources has significantly increased in recent years. When a plant-based diet is well planned, it can be implemented in all stages of life. Vegan diets that restrict calorie-intake, quit one or more food group. Vegans should carefully regulate their dietary intake of all micrnutrients by addition of supplements to avert micronutrient deficiencies in the long run. To provide vitamin B12 , vitamin D, calcium and iron, you should ask for advice to your doctor and nutrionist and take supplements if needed. It is necessary and important to follow up-to-date dietary guidelines and studies so vegans follow healthcare professionals.

Conflict of Interest

The authors have no conflict of interest to declare.

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