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Vegetarian nutrition

Jaiswal Apoorva and Dr. Gupta Alka

Abstract
A vegetarian diet is a type of diet that excludes meats, or seafood's, or sometimes even eggs and dairy. People choose to have a plant-based diet like that is called vegetarians, and some of them do so for the purpose of preventing and treating disease. Because of the higher intake of vegetables, grains, fruit, nuts and fiber from a vegetarian diet and lower intake of saturated fat and cholesterol, a vegetarian diet has health benefits in lowering the risks of getting chronic disease like obesity, cardiovascular disease, and maybe even cancer. However, some people believe that eating a plant-based diet might cause an increased risk of deficiency of certain nutrients. The evidence available suggests that through carefully planning their diets and eating fortified food or supplement regularly, vegetarians can certainly be able to meet their nutrition needs. In order to give people who are considering to become a vegetarian some information about the health benefits and suggestions of having a plant-based diet, in this article, we carefully describe and analyze the relationships between vegetarian diets and BMI, obesity, and cardiovascular disease, and then the relationship between vegetarian diets and mortality from the commonest causes of death and cancer.

Keywords: Vegetarian diet, vegans, lacto-Ovo vegetarians, obesity, cardiovascular disease, type2 diabetes, cholesterol level, vitamin B12, iron, calcium

Introduction
Vegetarian nutrition is the set of health-related challenges and advantages of vegetarian diets. Appropriately planned vegetarian diets are healthful and nutritionally adequate for all stages of the human life cycle, including during pregnancy, lactation, infancy, childhood, and adolescence (American Dietetic, Association; Dietitians of, Canada, 2003). However, vegetarian diets deficient in vitamin B_{12} or calories may compromise children's health and development (Black, Maureen, 2008) [3]. The UK National Health Service recommends that vegetarian diets should also follow the general recommendations for healthy diets, such as low fat, salt and sugar intakes and 5 fruits or vegetables a day. Qatar's public health ministry states, "One cannot be a healthy vegetarian by going to a fast food restaurant and ordering french fries and soda!" Evidence suggests that vegetarians generally have lower rates of coronary heart disease, obesity, hypertension, type 2 diabetes, (American Dietetic, Association; Dietitians of, Canada, 2003) and osteoporosis. Vegetarian diets tend to be rich in carbohydrates, omega-6 fatty acids, dietary fibre, carotenoids, folic acid, vitamin C, vitamin E, potassium and magnesium. They are possibly low in saturated fat, cholesterol, and animal protein.

Vegetarian diets are often heterogeneous in composition, involving a wide range of dietary practices and individual dietary restriction. In practice, adopting a vegetarian dietary pattern is traditionally interpreted to mean an absence of meat (Fraser G.E 2009) [10]. Variations of vegetarian diet include lacto-vegetarians (includes dairy) and lacto-ovo-vegetarians (includes dairy and eggs). Vegan diets have further restrictions imposed and exclude all foods of animal origin. Additionally, vegetarian diets are characterized by high consumption of fruit; vegetables, legumes, nuts, grains and soya protein-food components, and each of these may independently be associated with positive health outcomes (American Dietetic Association 2009). Researches and evidences have shown that a vegetarian diet can play a role in lowering the risks of having certain chronic diseases. The molecular mechanism and principle of vegetarian diet are hot topics. In this review, we discuss about how a vegetarian diet can lower the BMI (body mass index) and then further reduce the risk of having obesity (Leitzmann, C.J.F.O.N. 2005) [21].

According to the research, people who have or who want to avoid having cardiovascular disease are also benefited from a vegetarian diet due to its higher intake of dietary fibers and lower intake of saturated fat compared with a non-vegetarian diet (Marsh, K., C. Zeuschner, and A.J.A.J.O.L.M. 2011) [26] Besides, effects of a vegetarian diet on cancer are also explore in this article. Furthermore, since a lot of people are concerning the possibility of malnutrition when adapting a vegetarian diet.

Definition and classification of vegetarian

Depending on various life styles, health considerations and religions, people always have different choices for their diets. Vegetarians is a group of people who abstain meat, eggs or milk consumptions from their diet, and normally have a diet that based on plants like vegetables, fruits, nuts, legumes and grains. In fact, there are many types of vegetarian mainly included Lacto-Ovo-Vegetarian, Lacto vegetarian, Ovo-vegetarian and vegan. In this case, "lacto" refers to dairy products and "Ovo" refers to eggs. So a Lacto-Ovo-Vegetarian consumes a plant-based diet that excludes meat, fish, and poultry but includes dairy and eggs; a Lacto-vegetarian has a plant-based diet that excludes meat, fish, eggs and poultry but includes dairy; a Ovo-vegetarian diet excludes meat, fish, dairy and poultry but includes eggs; and Pesco-vegetarian is someone who also consume fish and seafood besides plants, and a vegan will exclude all the animal products in their diet (Craig, W.J. and A.R. Mangels, 2009) [24].

The reason why people would like to choose a vegetarian diet is mainly because they want to have a longer life span. Researchers have shown that compared with non-vegetarians, vegetarian normally have a lower mean BMI, a lower average plasma cholesterol concentration, which are among the commonest causes of death. Based on experimental data, researchers have suggested that a vegetarian diet may carry advantages for prevention of obesity, type II diabetes, ±cardiovascular disease and cancer. Because compared with a non-vegetarian diet, a plant based diet tend to be lower in saturated fat and cholesterol, and have higher amount of dietary fiber, magnesium and potassium, vitamins C and E, folate, carotenoids, flavonoids, and other phytochemicals (Craig, W.J. and A.R. Mangels, 2009) [9].

Role of a vegetarian diet in controlling disease

The beneficial effects of a vegetarian diet on control chronic disease have been reported for numerous times in previous studies. Here, we provide a systematic review of the effect of a vegetarian diet on obesity, type2 diabetes, cardiovascular disease and cancer. Because of the higher intake of vegetables, grains, fruit, nuts and fiber from a vegetarian diet and lower intake of saturated fat and cholesterol, a vegetarian diet or vegan diets demonstrate strong effects on losing weight, and then further lowering the risks of having chronic disease like obesity and cardiovascular disease and also potential impacts on cancer.

Obesity

The prevalence of obesity is increasing nationally and worldwide, and a diet that contains less saturated fat and more fibers are always recommended to obese people. A vegetarian eating patterns have been associated with lower BMI, and BMI increased as the frequency of meat consumption increased in both women and men (Kuczmarski, *et al*., 1996) From a cohort study collecting data from 22434 men and 38469 women, the results show that the mean BMI was lowest in vegans (23.6 kg/m2) and incrementally higher in lacto-Ovo-Vegetarian (25.7 kg/m2), pesco-vegetarian (26.3 kg/m2), semi-vegetarians (27.3 kg/m2) and non- vegetarians (28.8 kg/m2). The lower BMI of non-meat eaters than meat eaters is partly due to a higher intake of dietary fibre and a lower intake of animal fat, and in men only, a lower intake of alcohol in their meal (Tonstad, S., *et al*., 2009) [30] Consistent evidence from clinical trials suggest that vegetarian diets may be helpful for prevention and management of weight-related conditions (P.N., *et al*., 1998). Researchers have shown that vegetarian diets and vegan diets in particular, appear to have beneficial effects on weight reduction. However, these benefits appear to attenuate over time (Barnard, N.D., *et al*, 2015) [6].

Type 2 Diabetes

Type 2 diabetes results from insulin insufficiency superimposed on long-term insulin resistance, and there are about 29 million people in the U.S. with type 2 diabetes. It has always a challenge to cure the type 2 diabetes. It is important for diabetics to control the amount carbohydrates in their diet. a fiber rich vegan diet is characterized by a low glycemic index and a low to moderate glycemic load (Huang, R.Y., *et al*., 2016) [15]. Some evidence indicates lower insulin resistance and higher insulin sensitivity in vegetarians compared to non-vegetarians (Fukagawa, N.K., *et al*) [16]. Studies have shown that higher intakes of vegetables, whole grain foods, legumes and nuts are associated with a lower risk of insulin resistance and type 2 diabetes, and they are beneficial for glycemic control in moral or insulin-resistant individuals (Waldmann, A., *et al*., 2007) [31]. On the contrary, processed meats like bacon or hotdog may increase the incidence of diabetes, possibly because of their nitrite content.

Cardiovascular disease

Large cohort studies have reported that vegetarians have lower risk of cardiovascular disease (CVD) and coronary mortality (K., Z.J.A., 2002). A combined analysis of 5 prospective studies demonstrate a 24% lower risk of mortality from ischemic heart disease (IHD) in vegetarians compared with non-vegetarians, with lacto-Ovo Vegetarians having a 34% reduced risk and vegans a 26% reduced risk. Findings also show large reductions in low LDL cholesterol levels 25-30% in healthy subjects of a vegetarian diets based on fruits, leafy vegetables and nuts, (Key, T.J., *et al*., 1999) and that phytochemical contained in vegetables can act like antioxidants to prevent blood clotting and platelet aggregation (Liu and R.J.T.A.J.O.C.N. 2003) [20]. Based on another relevant study, the lower intake of saturated fat, increased consumption of soluble fiber, whole grains, legumes, soy proteins and nuts from a vegetarian diet are likely to contribute to its cardiovascular benefits. Higher risk of coronary heart disease (CHD) (Hu, F.B.J.A.J.O.C.N., 2003). A plant-based diet has a role of preventing chronic disease included CVD.

Cancer

Cancer is a leading cause of death worldwide and lots of scientists are trying to cure it. There is hypothesis saying that a plant-based diet might play a role in lowering the risks of having cancer like lung, colorectal, breast, prostate and stomach cancer, but the results are not adequately convincing and more study is required (Bernstein, A.M., *et al*., 2010) [4]. Findings suggest that the high fiber intakes of vegetarians

may play a essential role in reducing colon cancer risk, since the bulking effect of the fiber may increase the transit rate of carcinogens through the bowel (Key, T.J., P.N. Appleby, and M.S.J.P.N.S. Rosell, 2006) [19], and then further reduce the surface contact exposure of carcinogens with the wall of the bowel, (Sanjoaquin, M., *et al*., 2004 and Fardet and A.J.N.R. 2010) [29, 11], thus some concluded that in populations with a low fiber intake, doubling the fiber intake could reduce the colorectal cancer by 40%.

Nutritional adequacy in a vegetarian diet

Although vegetarian diets show lots of health benefits of preventing chronic diseases like overweight, CVD and diabetes, people concern about the nutrients contained in a plant-based diet, because some nutrients might be more difficult to obtain from a plant-based diet compared with a diet contained meat. Nevertheless, studies prove that as long as people carefully plan their diets and use fortified food or supplement regularly, a vegan diet can be nutritionally adequate for individual's needs.

Iron

Iron is an essential mineral to the formation of haemoglobin and myoglobin, which carry the oxygen in the blood and the muscle. Since the nonheme (inorganic) Fe from plant sources is less well absorbed than heme Fe from animal sources, lots of people are concerning about how much Fe can be drawn in from a vegetarian diet (Loehrersr, P., 2007). Food component that enhance iron absorption are normally food of animal origin, and foods that inhibit iron absorption are mainly plant absorption. In fact, the vitamin C and other organic acids found in vegetables and fruit can enhance iron absorption and reduce the inhibitory effects of phytate, so then the iron status can be improved.

Calcium

Calcium is an important mineral for bones, muscle, blood clotting and nerve. Calcium intakes of lacto-Ovo-Vegetarians are similar to, or higher than those of non-vegetarians, and intakes of vegans tend to be lower than both groups and may fall below recommended intakes. Although axlates, phytate and fibre in plant food decrease calcium availability, it is shown that absorption of calcium from many pant foods is excellent (Loehrersr, P., 2007) [22]. Therefore, compared with non-vegetarian, lacto-vegetarians seem to be at greater risk of osteoporosis, and vegans are at increased risk of not meeting their calcium needs, especially during the rapid growth phase (Messina V, *et al.* 2004). However, many vegans can find it easier to meet their calcium needs if calcium-fortified foods or dietary supplements are utilized.

B-12

Vitamin B-12 is only contained in food derived from animals. The main sources of vitamin B-12 for humans in a non-vegetarian diet are meat, fish, milk, cheese and eggs (Messina V, *et al.* 2004), and in a vegan diet, main resources of B-12 are omitted. Lacto-Ovo-Vegetarians can obtain adequate vitamin B-12 from dairy foods, eggs, of other reliable sources, but for vegans, vitamin B-12 can only be obtained from regular use of vitamin B-12 fortified foods like fortified soy and rice beverages. Vitamin B-12 deficiency can contribute to the development of hyperhomocysteinemia, which has been recognized as a risk factor for atherothrombotic and dementia. So for people who are adapting a strict vegan lifestyle, it is essential for them to take supplements and B-12 fortified food, and regular check of vitamin B-12 status is also recommended.

Protein

Despite the long-standing, widespread belief that vegetarians must consume grains and beans within a short time to make a complete protein that contains all 9 essential amino acids that must be supplied through diet; Plant foods rich in protein include soy beans and soy products such as tofu, veggie burgers, and soy milk; other legumes; nuts and seeds; and cereal grains (Craig, *et al.*, 2001).

Omega-3 fatty acids

Vegetarian diets can be low in omega-3 fatty acids (O3FAs). Major vegetarian O3FA sources include algae, hempseeds and hempseed oil, walnuts, flaxseeds and flaxseed oil, olive oil, canola oil, avocado, and chia seeds. A potential problem is that vegetarian diets lacking eggs or generous amounts of edible seaweed generally lack a direct source of long-chain O3FAs such as eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA). Vegetarian diets may also have a high ratio of omega-6 fatty acids to O3FAs, which inhibits the conversion of short-chain fatty acids such as alpha-Linolenic acid (ALA), which is found in most vegetarian O3FA sources, to EPA and DHA (American Dietetic, Association; Dietitians Of, Canada, 2003).

Benefits of having a vegetarian diet

Adopting a vegetarian diet can definitely lead to a better health. A vegetarian diet is generally associated with an increase in fiber, folic acid, magnesium, vitamins C and E, unsaturated fat, and countless phytochemicals content.

Low risk of diabetes: Vegetarian diet is inversely proportionate to the risk of developing diabetes (Lee Y, Park K. 2017).

Reduction of blood cholesterol levels: Vegetarian diets could effectively lower blood concentrations of Total-Cholesterol, Low Density Lipoprotein- C, High Density Lipoprotein- C, and non-High Density Lipoprotein- C (Wang F, *et al*. 2015).

Improvement of Mood: Restricting meat and its products, mood improvements did happen. This is because that the vegetarian diet has low Arachidonic acid (associated with mood disturbances) (Beezhold B.L, Johnston C.S. 2012).

Reduction in risk of developing cataracts and kidney stones: By replacing the non-vegetarian diet with the vegetarian diet, will result in a higher urine pH and thus low chances of developing kidney stones (Heilberg I.P, Goldfarb D.S. 2013).

Reduction in risk of developing cardiovascular and cancer diseases: Vegetarianism is quite helpful, in reducing the incidence rate of diseases like cardiovascular (reduction in risk by 7%) and cancer diseases (reduction by 8%) (Bezsheiko V. 2017).

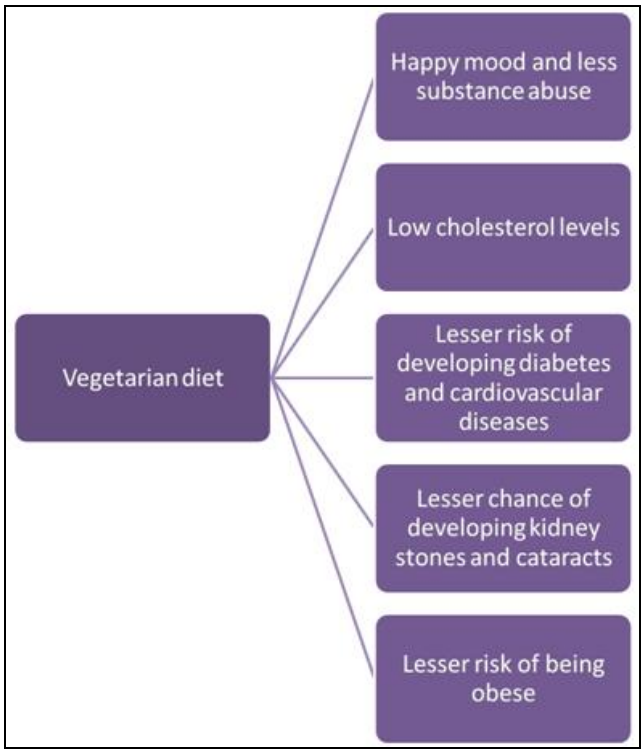

Fig 1: Benefits of having a vegetarian diet

Nutritional adequacy of vegetarian diets

Carefully planned vegetarian and vegan diets can provide adequate nutrients for optimum health (American Dietetic Association 2009). Evidence suggests that infants and children can be successfully reared on vegan and vegetarian diets (Mangels A.R & Messina V 2001 and Messina V & Mangels A.R 2001) [25]. However, all dietary practices, including non-vegetarian diets, can be deleterious for health if essential nutrients are not consumed according to an individual's needs. Therefore, vegetarian and vegan diets need to ensure a balance of nutrients from a wide variety of foods, especially for vulnerable groups such as pregnant or lactating women and children. Nutrients most likely to be deficient in unbalanced or very restrictive vegetarian diets are Fe, vitamin D, vitamin B12 and n-3 fatty acids.

Conclusion

Vegetarian diet is a boon to health. It can help a person to have a lower cholesterol level, lower weight, lower blood pressure, and a reduced risk of developing cardiovascular diseases. It also helps in preventing the deadly chronic diseases like diabetes and cancer. It may also help in prolonging the longevity. However, if the diet is not planned properly, it may be proved to be a bane to the health. In my opinion, I would suggest everyone to consider a vegetarian diet as an option to the adjuvant therapy if some is at a borderline of developing any of the diseases like cardiovascular diseases, kidney stones, hyperlipidemia, obesity and type2 diabetes. If a plant-based diet is appropriately planned and fortified food or supplements are taken regularly, the vegetarian diet is actually nutritionally adequate.

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