Chapter

Vegetarian or Vegan Diet: Stimulating or at Risk to Mental Health?

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Abstract

Vegetarians and vegans are more preoccupied with their health and conscious of their food habits than omnivores and often have pronounced views on killing animals for food. They are generally aware of a healthy lifestyle. Their mental attitudes, strengths and vulnerabilities may differ from meat eaters. Nowadays, health considerations would seem to play a role in the decision to become vegetarian/vegan. This chapter presents an overview of the most recent scientific literature with some emphasis on aspects of the relation between psychiatric disorders and personality characteristics in subjects with a vegetarian or vegan lifestyle compared to subjects who do not follow this lifestyle.

Keywords: vegetarian, vegan, mental health

1. Introduction

There are about 1.5 billion vegetarians worldwide, only 75 millions of whom are so by choice. The others are vegetarians out of necessity. Most of the latter will start eating meat when they can afford it [1]. In this chapter we will focus on people who are vegetarian/vegan of their own free will.

The earliest description of the vegetarian diet dates back to 800 BC and is related to Buddhism and Hinduism in ancient India, whose basic belief is in the unity of all living beings. *'Ahimsa'* or non-harming is a strong element in these religions. Today, people who favour ancient Indian lifestyles or habits such as yoga, are also in favour of plant-based diets. For example, 30% of UK yoga teachers follow a plant-based diet, which is 25 times the proportion in the general UK population [2].

In the western world, Pythagoras, the ancient Greek philosopher and mathematician formulated his ideas about reincarnation, which, as a consequence, led him to avoid eating meat. At the same time, around 600 BC a number of other religious groups (e.g. Orphism) also banned eating animal products.

Pythagoras can be considered the father of ethical vegetarianism and this is where the term *Pythagorean way of life* originates. Pythagoras had followers among influential philosophers and writers and his influence on nutrition in Europe continued until the 19th century.

In medieval Europe there had been no real popular interest in vegetarian food except among some philosophers and writers. The first Vegetarian Society in England was only founded 1847, with other countries following [3]. Interest in plant-based diets have been growing ever since.

Today, people choose plant-based diets from different motives, such as health, taste/disgust, animal welfare, environmental concerns, and weight loss [4]. One reason for choosing a plant-based diet is a healthy lifestyle [5], plant-based diets give some protection against the risks of developing somatic diseases [6]. For example, a vegetarian diet has a protective effect on the incidence of and mortality from heart diseases and cancer [7] and the risk of diabetes [8, 9].

The choice of a vegetarian diet is often related to how people see themselves and how they see others. Their diet has become part of their identity [10]. Nowadays, a growing number of people eat a plant-based diet because they are concerned about climate change [3].

It is not surprising, therefore, that psychological research on everyday eating habits and changing behaviours, lifestyle aspects and their consequences is growing [11]. A recent study found a possible relationship between perceived masculinity and diet preferences with some (weak) evidence that veganism (slightly stronger for males) leads to perceptions of decreasing masculinity when compared to omnivores [12].

People have different conceptions about food and lifestyle. Because of differences in personal and psychological characteristics there may be a difference between people who use different diets. This chapter discusses whether eating a plant-based diet influences mental state, and if so: is it different from that of people with other eating habits?

2. Lifestyle

Research has shown that a healthy lifestyle has a positive influence on both physical and mental health. A longitudinal study with German (n = 2.991) and Chinese students (n = 12.405) shows that in people with a healthier lifestyle psychological well-being is higher and mental health problems are fewer compared to groups with a less healthy lifestyle. Lifestyle factors such as lower body mass index, high frequency of physical and mental activities, non-smoking, a non-vegetarian diet, and a more regular social rhythm were positive predictors of mental health [13].

Keeping companion animals is part of a lifestyle. Most companion animals are omnivores that also eat meat. In a study with 3.673 pet owners, the number of vegetarians (6.2%) and vegans (5.8%) was higher than in the general population. Only a minor part of these owners (1.6%) fed their animals a plant-based diet. All pet owners feeding their pets a plant-based diet were vegans, with the exception of one vegetarian dog owner [14].

The country with the highest percentage of vegetarians is India, with about 40% of the Asian Indians being vegetarian. A study on this population shows that a vegetarian diet does not necessarily imply a healthy lifestyle. Nowadays, people eat more refined and processed foods, fried foods and refined carbohydrates instead of whole plant foods than before. In recent years, the number of Asian Indians who needed bariatric surgery was higher in female vegetarians than in non-vegetarian females because of a higher incidence of morbid obesity [15].

Similar results were found in an Iranian population, where a plant-based diet with wholesome plants (e.g. whole grains, fruits, vegetables, nuts, legumes, vegetable oils) was associated with fewer psychological disorders and a diet with unhealthy plant foods was associated with increased risks of obesity and depression. A plant-based diet, rich in wholesome foods was inversely associated with psychological disorders. Furthermore, unhealthy plant foods (e.g. fruit juices, sweetened beverages, refined grains, potatoes, sweets/desserts) were associated with increased risks of obesity as well as depression [16].

3. Personality characteristics

Not everybody chooses a plant-based diet. Socio-demographic factors are different for meat eaters and vegetarians/vegans. In a French cross-sectional study based on self-reports and including 93.823 participants it was shown that vegetarians' educational levels were higher and vegans' were lower than those of meat eaters and vegans had a lower educational level than meat eaters. Vegetarians were more likely to be young women, and self-employed than meat eaters. Their diets were the most balanced in terms of nutrients. Vegetarians were more strict at following the French dietary guidelines than non-vegetarians, and also had fewer nutritional deficiencies in antioxidant vitamins (such as vitamin E) compared to meat eaters. Vegans, on the other hand, showed more deficiencies in some nutrients (especially vitaminB12) compared to meat eaters [17]. Also, in a study from the US found that vegetarians and vegans who had chosen this diet for health reasons were more likely to be highly educated, female and physically active [18].

Not everyone opting for a vegetarian/vegan diet continues their plant-based diet. A remarkable finding is that conservative political ideological views are a predictor of a return to eating meat [19, 20].

Semi-vegetarians' and flexitarians' motives differ from those of vegans, lacto-ovo-vegetarians, and omnivores. Semi-vegetarians and flexitarians are more vulnerable to engaging in maladaptive eating habits than those engaging in more extreme forms of meat restriction. These findings hold for all ages and genders [21].

In addition to reasons mentioned and unknown reasons, personality characteristics can also play a role. Individual differences in personality may play a significant role in explaining individual food choices. In this context, the Five-factor model of personality [22] has often been investigated. This model describes a structure of personality characteristics containing 5 factors: neuroticism, extraversion, openness to experience, agreeableness and conscientiousness.

Neuroticism, conscientiousness and extraversion have a significant direct influence on eating habits and food choices. Vegetarians and semi-vegetarians were found to be more neurotic compared to omnivores [23].

A high degree of openness to new experiences would seem to be a powerful predictor of vegetarian food choices [20, 23, 24]. On the other hand, associations between meat consumption and openness to new experiences were also found [25]. This appears to vary depending on the type of meat consumed [26]. The associations with respect to conscientiousness and meat consumption vary, with positive and negative relationships having been reported in different studies [26, 27]. Extraversion has been linked to higher meat consumption [27]; a lower degree of extraversion has been related to a lower frequency of animal product intake [28]. Vegetarians and semi-vegetarians appear to be more neurotic and depressed than omnivores [23]. Neuroticism also influences the intake of sweets and savoury foods due to emotional and external eating [25]. Studies exploring associations between agreeableness and dietary style have shown mixed results [23, 25, 27]. In a large study (n = 13.892) a comparison was made between three eating styles: *carbohydrate-based food* (e.g., bread, pasta, snacks), *meat* (e.g. red meat, poultry), and *plant-based food and fish* (e.g. vegetables, fruits, legumes, fish).

These three dietary styles showed different associations with personality. Eating plant-based food and fish was positively associated with openness, conscientiousness, and emotional stability while meat consumption was negatively associated with openness and emotional stability, and positively associated with extraversion [24].

In a study about the relation between the dark triad of personality (Machiavellianism, narcissism and psychopathy) and diet it was found that

omnivores scored higher on these traits, but that these effects weakened or disappeared when corrected for gender [29].

In a small study using another method (the implicit association test) it was found that a positive attitude to plant-based diets was related to a more emphatic sensitivity towards humans and animals and also to a positive attitude towards healthy and natural products. There was a trend suggesting that vegetarians have a higher capacity to experience compassion for others who have negative experiences as compared to omnivores. Vegetarians showed a stronger association than omnivores, and flexitarians scored somewhere in between [30].

It should also be mentioned that there are studies that failed to find significant differences between vegans/vegetarians and omnivores with respect to the Big-Five personality traits, or found different results altogether.

An example is an online survey in which it was found that vegans were less neurotic than lacto-ovo vegetarians, more open and had more compatible personality traits, were more universalistic, empathic, and ethically oriented, and had a slightly higher quality of life [31].

4. Mental health

4.1 Depression

In the above a relation has been described between neuroticism and vegetarianism. It is also known that people with high neuroticism scores are more vulnerable to developing depression [32].

Depression is a mental state which is often associated with neuroticism. As mentioned above a vegetarian lifestyle is often associated with neuroticism. Therefore, it is assumed that a relation between depression and a vegetarian diet exists. Some studies show that in western culture a vegetarian diet is associated with a higher risk of depression [33]. In a longitudinal study among 9.668 male partners of pregnant women, vegetarians (3.6% of the sample) had higher depression scores on self-reports [34].

In a Chinese study of the elderly, the use of a vegetarian diet posed a higher risk for depressive symptoms, especially in men [35]. In a systematic literature review, including 18 studies with a total of 160.257 participants, 11 out of 18 studies showed that plant-based diets were associated with poorer mental health, 3 out of 18 studies showed better mental health, 4 out of 18 studies were equivocal. The higher-quality studies showed that people avoiding meat consumption ran a higher risk of depression/anxiety and/or self-harm behaviours. Despite differences in methodology and quality of the studies, the authors conclude that ending meat consumption is not a good strategy to promote psychological health [36]. In another recent systematic review and meta-analysis, including 13 studies with 17.809 individuals, it was found that vegetarians/vegans are at a higher risk of developing depressions [37].

In Seasonal Affective Disorder –winter type (SAD), an association between vegetarianism and SAD was found.

In an SAD outpatient clinic, the number of participants following a vegetarian diet was significantly higher than in the general population, and in a large group of vegetarians from Finland (from the Finnish national FINRISK 2012 study) the number of people with SAD was higher compared to omnivores [38].

Other studies arrive to different conclusions. In a study of diabetic patients in Iran, a plant-based diet seems to protect against developing depression, anxiety and stress, and these patients were better sleepers compared to meat eaters [39]. In a study of 15-year olds in four developing countries (India, Vietnam, Peru and

Ethiopia) no association was found between a vegetarian diet and emotional symptoms [40]. In a study of endurance runners, no differences in mental health were found between vegetarian, vegans and omnivores [41].

In yet another study, the authors concluded that healthy dietary patterns do matter. The authors did not just compare plant-based diets versus diets containing meat. A healthy dietary pattern containing among other things fruits, whole grain, fish, olive oil, low-fat dairy and a low intake of animal food was compared to an unhealthy dietary pattern containing processed foods, red meats, refined grains, high-fat dairy products, sweets and a low intake of fruits and vegetables. The unhealthy diet was associated with an increased risk of depression [42]. Cultural beliefs and economic circumstances may also play a role. In a large-scale multinational cross-sectional study in four different countries it was found eating a vegetarian diet was not positively or negatively associated with mental health in the US, Germany and Russia, while in China vegetarians did run a higher risk of developing depression [43].

If a relation between food and depression exists, the question arises what ingredients improve depressed mood, and more importantly what ingredients can help prevent or recover from depression. In a literature study, LaChance and Ramsey [44] found 12 antidepressant nutrients (folate, iron, long-chain omega-3 fatty acids (EPA and DHA), magnesium, potassium, selenium, thiamine, vitamin A, vitamin B6, vitamin B12, vitamin C, and zinc) which are found in plant foods like leafy greens, peppers and cruciferous vegetables, and sea-foods like mussels and oysters. These findings could lead to a ranking system of nutrients which can be used as a treatment opportunity for people with mental health issues. Another study presents some evidence for ranking plant-based food. In adolescents, regular, daily, diet of green and yellow vegetables was associated with a lower risk of depression compared to those who never ate these vegetables or only 1–2 times a week [45]. In a large cohort study (90.380 subjects) it was found that every exclusion of a food group (not exclusively animal products) from a diet was associated with the risk of developing depressive symptoms. As more food groups (meat, poultry, fish, eggs, milk and other dairy products, vegetables, legumes and/or grains) were excluded the more the risk of depression increased [46]. In addition to this, it is worth mentioning that it is still a matter of debate whether a vegetarian/vegan diet poses a risk to brain development even if supplements are added like iron, zinc and vitamin B12 [47, 48]. Some authors argue in favour of eating whole foods, not nutrients and emphasize the need for more holistic approaches in nutrition to preserve health, animal welfare, and the planet [49]. A 12-week intervention of plant-based diet, exercise, mindfulness, lifestyle and behaviour modification showed good results in the treatment of depression and anxiety, results which after 6 months still existed in most participants. In this study, it was impossible to distinguish between the different factors of the intervention, so it is unclear what the contribution of diet was to the benefits of the treatment [50].

4.2 Anxiety

A study of first year university students in the US found that vegetarians had higher perceived stress levels compared to non-vegetarians [51].

Although there is some evidence that a plant-based diet has some negative associations with mental health, there are also some studies contradicting these results. An international online survey recruited participants via diet-related social networks. Participants were divided into three group: vegans, vegetarians and omnivores. Vegans scored lower than omnivores on mood items, and male participants scored lower on anxiety scores compared to omnivores. Stress scores

were lower in vegan females only. The difference between these results and other studies may be due to of methodological differences and a possible selection bias [52]. In their meta-analysis Iguacel et al. [37] found that a vegetarian/vegan diet was related to lower anxiety scores. Because of the heterogeneous character of the studies included, the authors made some sub-group analyses. In one of these subgroup analyses of anxiety it was emerged that mainly younger participants (under 26) ran a higher risk of developing anxiety. This last was a finding from the higher quality studies only.

4.3 Eating disorders

People following a vegetarian or vegan diet are very conscious of their eating habits, and so are patients with eating disorders.

In a representative German survey (n = 2.449), participants were asked if they were vegetarian/vegan (5.4%) or omnivores and then filled out the Eating Disorder Examination Questionnaire (EDE-Q8). Vegetarians/vegans scored statistically significantly higher on the EDE-Q8 [53].

A study comparing subjects without eating disorders, with a non-clinical eating disorder and with a clinical eating disorder found that the group with the most severe eating disorders contained the highest number of vegetarians/vegans [54]. A comparison between vegetarians and omnivores yielded an association between following a vegetarian diet and orthorexia (unhealthy obsession with healthy eating), while omnivores often had more cognitive restraint as well as a higher body mass index [55].

Semi-vegetarians have been defined as vegetarians who only rarely eat meat. In a study looking for associations between diets with orthorexic tendencies and depression, semi-vegetarians with strong orthorexic tendencies show more depressive symptoms than omnivores and vegetarians. The authors speculate that semi-vegetarians with orthorexic tendencies have high or pathological health-related motives to become vegetarians and have failed to do so, which can be depressogenic because of the dissonance between their conception of good food and their actual behaviour [56].

4.4 Other disorders

In a case study describing a 47-year-old female patient with a five-year history of psychosis, a serious vitamin B12 deficiency was found. Vitamin B12 in food is present in meat, fish, dairy products, and eggs. The patient had been following a strict vegan diet for seven years, and after administration of vitamin B12 the complaints disappeared. The authors point out that professionals should be aware of veganism as a cause of vitamin B12 deficiency and hence psychiatric complaints [57]. A vitamin B12 deficiency can lead to various mental disorders, such as depression, bipolar disorders, psychosis, and dementia [58]. It was found that, compared to omnivores, vegetarians often have vitamin B12 shortage and therefore are vulnerable to developing neuropsychiatric and neurological problems [59].

A cross-sectional survey in China of young children (3–6 year) showed a relation between dietary patterns and attention-deficit/hyperactivity disorder (ADHD). Unhealthy dietary patterns with processed foods and snacks were positively associated with ADHD complaints, and the more vegetarian food patterns negatively [60]. Unhealthy diet patterns may lead to a poor biochemistry status affecting ADHD behaviour. If this is the case, mental health professionals should be aware of this, in order to improve the ADHD symptomatology. No causal relationship between diet and ADHD symptoms is shown, but food preference patterns

can be a consequence of ADHD behaviour [61]. Since people suffering from ADHD symptoms regularly have nutritional and vitamin deficiencies, nutritional assessments to detect potential deficits or allergies should be performed at the start of a treatment. Scientific evidence of using diet as a treatment of autism, as sometimes claimed, is weak and poor. A vegetarian diet does not lead to nutritional threats as it includes eggs and milk [62].

5. Neurologic/neuropsychologic aspects

In a *comprehensive* review of the literature on randomized clinical trials some evidence was found that vegetarian diets prevent or delay cognitive decline in elderly adults.

Some plant foods (citrus fruit, grapes, berries, cocoa, nuts, green tea and coffee) improve specific cognitive domains, most notably frontal executive functions [63].

A different conclusion can be reached by using a different review methodology when examining the literature. In a *systematic* review of the literature on the effects of plant-based diets on body and brain, no evidence was found for the putative effects of a plant-based diet. No causal relation was seen between the use of a plant-based diet and effects on cognitive functions, mental and neurological functioning, nor for any underlying mechanism [64].

6. Conclusion

In the literature there is a growing number of papers mentioning a negative relation between mental health and a vegan/vegetarian diet; this particularly holds for a relation between vegan/vegetarian diet and depression. In most studies, it is unclear if a plant-based diet leads to depression or other mental problems, or if people with mental issues choose a vegan/vegetarian diet more often. It is possible that people who are vulnerable for depression, anxiety and stress are more concerned about their own well-being, health and the fate of the Earth, and therefore make a more conscious choice of diet.

Although many relations have been found, it is good to emphasize that a large number of these studies suffer from methodological limitations. Most are cohort studies or cross-sectional studies, in which no causal relation can established. In a recent study, data of several studies were pooled and no association was found between vegetarian diet and depression (pooled data of 10 studies) and also no association between vegetarian diet and anxiety either (pooled data of 4 studies) [65].

Another recent study shows that reviewing methodology matters. In this study, where the conclusions of different reviews about the effects of diets on depression are compared, it is shown that *narrative* reviews come to stronger conclusions than *systematic* reviews with and without meta-analyses [66]. Authors' selection bias and differences in a priori assumptions for the meta-analyses may also play a role. For more robust conclusions clinical RCT trials are needed.

Some reasons (other than ethical, religious, animal welfare or health) for the growing popularity of plant-based diets are climate change and high greenhouse gas (GHG) emissions. Meat consumption is a major contributor to global warming. Looking for plant-based alternatives as a resource of proteins instead of animal foods is claimed as an attractive alternative. This can lead to a reduction in the use of arable land, nitrogen fertilizer, water and GHG emissions and therefore can lead to improved public health [67]. But there are other factors than proteins in food that are important for physical, and mental health (as discussed in this chapter).

In a small minority of people in Europe and the US environmental motives become a more popular choice, especially under young females, for the reduction of meat consumption [68].

A possible solution besides a plant-based diet could be the use of cultured meat (in vitro from animal cells), which can address the ethical, environmental and some psychological disadvantages of conventional meat production. This is a rather new area in food production, far from large scale production or social acceptance, but it might contribute to removing many drawbacks of current meat production in the future [69].

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