

HEALTH ASPECTS OF VEGETARIANISM IN INDIA:
Is it better for health and environment to be a Vegetarian?

SUMMER TRAINING REPORT

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2019-2021



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2020

CERTIFICATE

This is to certify that Ms. Resham Goutam has undergone the Summer Training from April-May 2020. The candidate herself completed the report assigned to her during the summer training. Her approach to the report was sincere and proactive. This summer training is in partial fulfilment of the course requirement recommended for the award of MBA in Health and Hospital Management.

I wish her success in all her future endeavours.

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ACKNOWLEDGEMENT

I would like to express my sincere gratitude to my university mentor, Dr. Neetu Purohit for her valuable guidance, time, and support when so ever I needed them and encouraging me to always to my best.

I would also like to thank my parents who constantly supported me and stood like a pillar of strength.

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ABBERRVIATIONS/ACRYNOMS

DR-NCDs- Diet Related-Non communicable diseases

BMI- Body Mass Index

WHO- World Health Organisation

CNNS- Comprehensive National Nutrition Survey

NFHS- National Family Health Survey

RDA- Recommended daily allowance

Paradigm- It refers to the assumptions, concepts, values, and practices that constitute a way of viewing reality.

HEALTH ASPECTS OF VEGETARIANISM IN INDIA:

Is it better for health and environment to be a Vegetarian?

I. Introduction

What we eat greatly influences our personal health and the environment we all share. Various studies have highlighted the likely dual health and environmental benefits of reducing the fraction of animal-sourced foods in our diets. In recent years, the vegetarian, Vegan, Plant-based dietary pattern has been adopted by an increasing number of people from all over the world.

The term 'vegetarianism' refers to a wide spectrum of dietary patterns characterised by an emphasis on plant foods and avoidance of animal foods. Ovovegetarians consume eggs, lactovegetarian's diet consists of legumes, grains, fruits, nuts and vegetables, together with milk and dairy products, while semivegetarians restrict the type of meat to only fish (pescovegetarian), poultry (pollovegetarian), or both fish and poultry (pescopollovegetarians). Finally, the strictest form of vegetarianism is veganism, and it involves avoidance of all foods of animal origin, including eggs and milk (Lanham-New, 2009).

Throughout history, different people have chosen vegetarian dietary patterns for a variety of reasons, including to demarcate important common cultural grounds, religious convictions, health concerns, concerns about animal welfare or the use of antibiotics and hormones in livestock, or a desire to eat in a way that avoids excessive use of environmental resources. The first philosophical arguments for animal food avoidance dating back to ancient Egypt were related to the belief in transmigration i.e. reincarnation of souls. In the centuries that followed, avoidance of animal foods was adopted among early Greeks and Roman philosophers & poets living more than two millennia ago promoted vegetarian diets for reasons related to ethics & health (Leitzmann, 2014). Their interest in vegetarianism may have been sparked by Indian Vegetarian Philosophers whose teachings were embraced by ancient Greeks including Pythagoras, who was considered as father of ethical vegetarianism (Stuart, 2006). Medieval Jewish commentators including Rashi & Maimonides, taught that the original diet that people were commanded to eat was a vegetarian diet (Schwartz, 1982).

Nowadays, among a variety of non-religious motivations for adopting a meat-free diet, the most highly ranked are weight loss, potential health benefits, disgust of meat smell and consistency, and moral imperatives to preserve the environment and avoid sacrificing animals. Another reason for adopting a plant-based diet is the environmental impact of food production as in terms of biological diversity and habitat loss, human consumption of animal based foods/products is estimated to be among the most negative factors affecting the preservation of terrestrial ecosystems (Machovina et al., 2015). Globally, animal agriculture is responsible for more greenhouse gases than all the world's transportation systems combined. With per capita meat consumption soaring, the meat industry has become one of the main factors in climate change. The reason for this is that countries tend to consume more

meat and dairy products as their average incomes rise: animal products are among the first things people spend money on once their basic needs are met. The knock-on effect of this 'nutrition transition' on global grain supplies in developing countries is becoming highly significant.

In India, the history of vegetarianism has its roots in the civilization of ancient India, and the origin of vegetarianism in this country has often been linked to the strong cultural and religious traditions that promote vegetarianism. A substantial proportion of the Indian population (20%-30%) are vegetarians (Key et al., 2006) (10%–62% for different regions) (Arnold et al., 2009).

Consuming meat may have some benefits but there are many dangers associated to it, either it's related to health or environment with is discussed later. This paper is divided into five sections. Following this introduction, review of literature and rationale are objectives & result. Then discussion on the various aspects of vegetarianism and ongoing practises related to vegetarianism in India is done. The next sub-section discusses models based on different paradigms, which is then followed by the conclusion.

II. Review of literature

Vegetarian diets and vegetarianism are an important consideration for nutrition and the environment. Vegetarian dietary patterns are diverse in India and are typically characterized by low consumption of animal-source foods, in particular red meat (**Agrawal S., 2017**). According to this paper diets are changing rapidly in India, with particularly pronounced increases in egg and dairy consumption. It is suggested in the paper that Vitamin B12 bioavailability remains a concern and should be addressed by exploring various dietary patterns associated with deficiency across various regions of India and identifying people who need supplementation. The food production and consumption pattern are very diverse and significantly changing due to the change in economic status, population pressures, urbanization, and lifestyle of people worldwide.

Early human food cultures were plant-based. Major religions such as Hinduism and Buddhism have recommended a vegetarian way of their life since their conception. It is discussed in this paper about recorded history of vegetarian nutrition from 6th century BC in Egypt, Europe, Roman empire, India etc to Renaissance era to modern era. A paradigm shift occurred at the turn of 21st century. Also examined the present state of vegetarianism and predicted the future of vegetarian This paper reveals that today; vegetarian nutrition has a growing international following and is increasingly accepted. The main reasons for this trend are health concern and ethical, ecologic, social issues. (**Leitzmann C., 2014**)

The food system adopted by modern society has very serious environmental impacts. This paper is highlighted the impacts of consuming non-vegetarian diet on the environment. According to this paper, environmental issues such as global warming and climate change can be minimized by adopting vegetarianism or by lowering the consumption of meat and other animal-based products. It should be mandatory on the part of government to label carbon footprint value on food products that would further helpful for consumers to choose

low impact food products. **(Choudhary A.K. & Kumar N., 2017)**. The consumption of meat and meat production has increased radically throughout the world. Global demand for food is expected to increase by 70 % by 2050 (FAO, 2009). This excessive growth in meat production/consumption brings several impacts on environmental resources. The paper discusses change in people's lifestyle and consumption pattern of nonveg food all over the world. Also put light over the consequences of meat production (livestock farming) on water, land use, rain forest and climate change are discussed. According to this paper, Action to replace livestock products not only can achieve quick reductions in atmospheric GHGs but can also reverse the ongoing world food and water crises so organizations should consider making advocating vegetarianism a major part of their "Save the Earth" campaigns. **(Mishra M. K., 2012)**. **(Fischer, J., 2019)** This paper reviews the literature on vegetarianism (veg) and meat-eating (non-veg) in India and describes the Indian food systems with specific reference to veg and non-veg, green dot and brown dot on products in the market. Also talked about the ongoing retail revolution and changing consumer culture that surrounds Indian food systems. Then presents some preliminary findings from ongoing ethnographic fieldwork conducted in Hyderabad). According to **(Kumari V. & Prasad R. K., 2018)**, the production and consumption pattern among Indian people. Also revealed that there has been a clear transition from foodgrain consumption to non foodgrain food and animal product consumption. The study is based on secondary data collected from Government sources, The study has concluded that increased production of foodgrain (rice, wheat etc) and non foodgrain (pulses, oilseeds, sugarcane etc) along with combined increased in income and better education would result in enhancement in monthly per capita consumption of food items in both rural and urban India.

Advances in nutrition research during the past few decades have changed scientists' understanding of the contribution of vegetarian diets to human health and disease. Diets largely based on plants foods, such as well-balanced vegetarian diets, could best prevent nutrient deficiencies as well as diet-related chronic diseases. Three models (early model, New model & Proposed model), which depict the expected health risks and benefits of a population following either a vegetarian diet largely based on plant foods or a diet largely based on animal foods (meat-based diet) , are presented in this concept paper. **(Sabate J., 2003)**. It discloses that recent scientific advances seem to have resulted in a paradigm shift: diets largely based on plant foods, such as a well-balanced vegetarian diets, are viewed more as improving health than as causing disease, in contrast with meat-based diets

III. Rationale

India is a country which is often promoted as a vegetarian country. Here, the vegetarian ideology is considered superior based on the ahimsa culture (non-violence). Indian vegetarian cuisine is appreciated all over the world for its varieties, taste and sometimes preferred over meat based.

Consuming meat may have some benefits but there are many dangers associated to it, either it's related to health or environment. Recent evidence from meta-analyses of epidemiological studies indicates that the long-term consumption of increasing amounts of red meat and particularly of processed meat is associated with an increased risk of total mortality, cardiovascular disease, colorectal cancer and type 2 diabetes, in both men and women. Also,

with the emerging nutrition transition in India, India is facing an "epidemic" of diet-related non-communicable diseases (DR-NCDs), along with widely prevalent undernutrition resulting in substantial socioeconomic burden.

The aim of this paper is to review various health benefits and risks associated with vegetarian diet, to determine the factors which influence in selection of plant-based diet, and nutritional profile, so as to understand optimal choices for healthy diets for the prevention of DR-NCDs, improve nutrition and reduce environmental impacts.

- **Research Question-** The research question concerns “Is being a vegetarian better for health and environment in India?”
- **Objectives-**
 - » To understand the health benefits of meat-free eating.
 - » To explore factors which influence people to prefer vegetarian diet in India.
 - » To explore health related risks associated with plant-based diet compared to nonvegetarian diet.
 - » To assimilate Nutritional profile of Indian Vegetarians
 - » To learn environmental effects of vegetarianism & non-vegetarianism
- **Methodology**
 - » Review of secondary research was conducted, the literature search was carried out in PubMed, ResearchGate and Google Scholar search engines up to December 2019.
 - » A manual search for all other references, national and medical databases was also carried out.
 - » For the purpose of this study, about 30-40 relevant papers or articles reporting relevant health outcomes (either beneficial or harmful), nutrition, environment effect associated with vegetarian diets especially focusing on India were included and reviewed.

IV. Result

Based on the conducted secondary research on various aspects of vegetarianism, it can be reasonably inferred that the beneficial effects of a vegetarian diet significantly outweigh the adverse ones. There are various health benefits of vegetarian diet in especially respect to prevention of DR-NCDs (Cancer, Cardiovascular diseases, Diabetes etc). The study shows that there are number of factors such as health concerns, ethical, religion or caste, gender, socio-economic status, geographical location etc, which influence people to prefer vegetarian diet in India. Then, it is explored that health-related risks associated with plant-based diet compared to nonvegetarian diet are some micronutrient deficiency which could sometimes leads to diseases such as anaemia, atherosclerosis etc. The environmental effects of consuming meat-based diet are Land & Water Consumption, Biodiversity, Climate change. Assimilated Nutritional profile of Indian Vegetarians suggests Indian's protein deficiencies as against the global recommended standard, as well as the poorer health outcomes of its vegetarian children. So, the answer to the research question “Is being a vegetarian better for health and environment in India?” is can't be decided as a well-balanced vegetarian diets, are viewed more as improving health than as causing disease, in contrast with meat-based diets, which could be beneficial for

privileged classes people suffering from or want to prevent DR-NCDs or looking for maintaining their health. Nevertheless, in case of under privileged children and pregnant women the vegetarian lifestyle may confer nutritional imbalances and consequent effects on long-term their health.

V. Discussion

Vegetarian Diet

A vegetarian diet could have many health benefits as well as some health risks associated to it. During the past 20 years, scores of nutritional epidemiologic studies have documented important and quantifiable benefits of vegetarian and other plant-based diets, namely a reduction of risk for many chronic degenerative diseases and total mortality. Vegetarian diet is more balanced than non-vegetarian diet as it includes fruit, vegetables, grains, pulses, legumes, nuts and meat substitutes such as soy products. In terms of nutrients, vegetarian diets are usually rich in carbohydrates, n-6 fatty acids, dietary fibre, carotenoids, folic acid, vitamin C, B9 and E, magnesium, potassium, carotenoids, plant sterols and many other Phyto-chemicals, which are commonly associated with numerous health benefits. And relatively low in protein, saturated fat, long chain n-3 fatty acids, retinol, vitamin B12, and Zn (Key et al., 2006). A vegetarian diet usually provides a low intake of saturated fat and cholesterol and a high intake of dietary fiber and many health-promoting phytochemicals. This is achieved by an increased consumption of fruits, vegetables, whole-grains, legumes, nuts, and various soy products. As a result of these factors, vegetarians typically have lower body mass index, serum total and low-density lipoprotein cholesterol levels, and blood pressure; reduced rates of death from ischemic heart disease; and decreased incidence of hypertension, stroke, type 2 diabetes, and certain cancers than do nonvegetarians.

Cardiovascular disease- To date, a large body of evidence has shown that a vegetarian diet is associated with significantly lower prevalence of overweight and obesity, as well as with a lower risk of cardiovascular hospital admission and 32% less mortality. A systematic review- Effects of Vegetarian Diets on Blood Lipids published in 2015 concluded that people who follow a vegetarian diet are likely to have lower overall cholesterol levels. A vegetarian diet usually provides a low intake of saturated fat and cholesterol and a high intake of dietary fibre and many health-promoting phytochemicals. The estimated reduction in blood pressure was associated with 9% decreased risk of death from coronary heart disease and can be equated to the health benefits of a 5 kg weight reduction or a low-sodium diet. As concluded by Crowe et al. (2013), even after accounting for body mass index, vegetarians, mortality from ischemic heart disease was 24% lower in vegetarians than in nonvegetarians.

Categorization of diets showed that, in comparison with regular meat eaters, mortality from ischemic heart disease was 20% lower in occasional meat-eaters, 34% lower in people who ate fish but no meat, 34% lower in lacto-ovo-vegetarians, and 26% lower in vegans.

Relationship between vegetarian diet and blood pressure has shown that a diet excluding meat, but involving regular consumption of dairy products, eggs and fish was associated with 4.8–6.9 mm Hg lower systolic blood pressure, compared to an omnivorous diet.

Cancer- The overall risk of cancer is somewhat lower in vegetarians compared to omnivores. However, when it comes to the location and type of cancer that can be prevented by plant-based diets, findings are rather scarce and inconclusive (Key, 2017). The prospective cohort study of

Bradbury et al. (2014) aimed at exploring the associations between fruit, vegetable and/or fibre intake and cancer risk and included more than 500,000 participants from 10 European countries. According to the results, the risk of gastrointestinal tract cancer and liver cancer was inversely associated with excessive consumption of plant-based foods. A recent study (Michelle et al., 2015) with 77,659 participants showed that vegetarians have a 22% lower risk of developing all colorectal cancers compared to non-vegetarians with a similar background. Furthermore, the authors emphasised that eating a pescovegetarian diet was associated with the lowest risk of colorectal cancer (a 43% risk reduction compared with omnivores). The wide range of antioxidants in a plant-based diet prevents oxidative stress that plays an important role in carcinogenesis and development of endothelial dysfunction, and in the initial steps of pathogenesis in atherosclerosis (Chauveau et al., 2013).

DIABETES- High fruit and vegetable intake as well as vegetarian diets have been associated with lower risk of diabetes type II (Cooper et al., 2015; Appleby and Key, 2016). Additional to that it contains substantially less saturated fat than nonvegetarian diets, and saturated fatty acids have been shown to reduce insulin sensitivity. Protection against type 2 diabetes associated with vegetarian diets is partly due to the lower BMI of vegetarians. The vegetarian diet typically includes foods that have a low glycaemic index such as beans, legumes, and nuts. Vegetarian diets are rich in vegetables and fruits, foods that reduce oxidative stress and chronic inflammation. The vegan group consumed ~650 g/day of fruits and vegetables, which is about one-third more than the amount consumed by nonvegetarians.

Monotonous vegetarian diets are nutritionally inadequate and without the appropriate monitoring and supplementation can result in severe nutrient deficiencies with detrimental health effects. Complete elimination of animal foods might not be associated with additional benefits for human health (Godos et al., 2017). Meat is a source of biologically valuable proteins, long chain n-3 fatty acids, essential trace elements (iron, copper, manganese, iodine, zinc, selenium), vitamin D and several B vitamins (Baltic et al., 2010; Ivanovic et al., 2016; De Smet and Vossen, 2016). Therefore, the potential drawbacks of vegetarian diets mostly refer to the reduced supply of essential amino acids, n-3 fatty acids, vitamin B12, zinc, iron and calcium. Vegetarian diet may result in changes adversely affecting the body, These include: hyperhomocysteinemia, protein deficiency, anemia, decreased creatinine content in muscles and menstrual disruption in women who undertake increased physical activity The vegan population exhibits an even higher tendency for anaemia, not because their iron intake is below recommended levels, but because non-haeme iron from plants is less bioavailable and because plant-abundant diets contain substances such as phytic acid and polyphenols/tannin, which can impair mineral absorption. Vitamin B12 deficiency is shown to be associated with atherosclerosis. Vitamin B12 requirements cannot be met without animal-based food intake or supplementation, and in affected people, B12 deficiency and the accompanying haematological symptoms can be mimicked by folic acid intake, which is high in vegan diets (Baltic et al., 2010; McEvoy et al., 2012). Also, the lower bone density in people consuming plant-based diets was confirmed.

Albert Einstein, the German-US physicist (1875–1955) believed that “Nothing will increase the chances of survival for life on earth as much as the evolution to a vegetarian diet”. The environmental impacts of the human diet are mainly depending on the type of diet consumed, its quantity, and origin. Dairy products, eggs, fish, and meat have the higher environmental

impacts, while starchy products, vegetables, legumes, and fruits have the lower impacts. The argument that a vegetarian diet is more planet-friendly than a carnivorous one is straightforward: If we feed plants to animals, and then eat the animals, we use more resources and produce more greenhouse gases than if we simply eat the plants. Livestock production is a major anthropogenic source of pollutants which affects soil characteristics and cause global warming. Livestock production affects the natural environment in two ways i.e., directly and indirectly. Direct impact caused by the emissions directly produced by the animal from enteric fermentation of fibre by ruminants, manure and urine excretion while indirect impact caused by indirect emissions from feed crops used for animal feed, emissions from manure application, CO₂ emissions from fertilizer production, emissions from processing and transportation of refrigerated livestock products

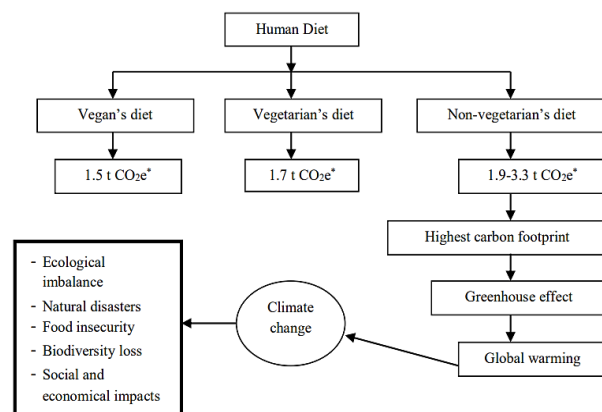
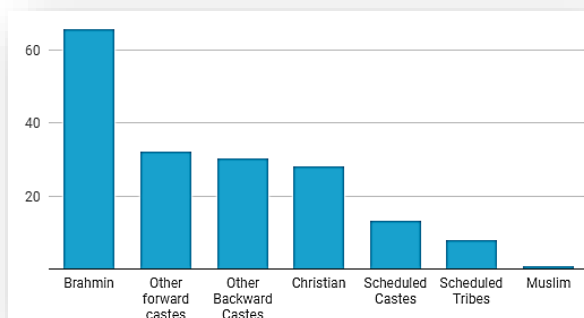


Figure shows inter-relationship of human diet with carbon footprints and climate change. The carbon footprint associated to non-vegetarian's diet is about twice the vegetarian's and vegan's diet. It means that nonvegetarians are contributing more for climate change which further leads to ecological imbalance, natural disasters, global food insecurity, biodiversity loss and social & economical issues. In terms of biological diversity and habitat loss, human consumption of animal-based foods/products is estimated to be among the most negative factors affecting the preservation of terrestrial ecosystems. (Machovina et al., 2015) – Agriculture contributes roughly 15% of all greenhouse gas emissions and half of this comes from meat production. Meat production contributes significantly to the acceleration of global climate change by adding a large quantity of greenhouse gases (GHG), i.e. mainly carbon dioxide (CO₂), methane (CH₄) and nitrous oxide (N₂O), to the environment. The CO₂ generated by fossil fuels used to power farm machinery, transport, to store and cook foods; CH₄ from enteric fermentation in ruminant livestock and N₂O released from soils mainly after the addition of fertilizers. A 2014 University of oxford study on British diets found that meat-rich diets- defined as eating more than 100 grams of meat per day per person- emitted about 7.2 kg of CO₂ per day as compared to 2.9 kg of CO₂ emitted by vegan diets. It also has a huge footprint in terms of land and water consumption since an estimated 30% of the world's land not covered with ice is used to grow food, not for humans but for livestock. According to Mishra (2012), it takes more than 2,400 gallons of water to produce 1 pound of meat, while to grow 1 pound of wheat, 25 gallons of water is required. The production of 1 kg of animal protein requires about 100 times more water than 1 kg of grain protein production. Livestock directly requires only 1.3% of the total water used in agriculture but when the water required for forage and grain production is included, the water requirements for livestock production significantly increase.

Vegetarianism in India

India is a secular nation and the culture of eating food differs between communities, regions, and religions. There are several factors such as health concerns, ethical, ecologic, social issues, religion or caste (Brahmins, Marwaris, Jains), gender, age, educational level, socio-economic status (ability to afford) as well as geographical location which influence selection diet. Khare's (1966) classic study of Indian food systems explores how Indian institutions, values, cultures, sacred/secular aspects as well as nutritional, economic, political and historical processes constrain everyday food practices. As noted by Menzies and Sheeshka (2012), five central food values, i.e. taste, health, time, cost, and social relationships, have the potential to significantly undermine people's commitment to a vegetarian diet chosen largely for health or moral reasons. Income and educational level play an important role in selection of diet. The consumption of milk or curd, fruits, eggs, and fish or chicken or meat increased with higher levels of maternal schooling and household wealth (CNNS 16-18). As Indians get richer, they are more likely to eat meat - until they become middle class. Middle-class diet transformation includes a preference for livestock and dairy products, sugar, fats and oils and highly processed convenience foods and drinks, all of which are readily available in the emerging supermarkets and fast-food outlets as well as pizzas, burgers, sweets and ice cream. However, from the middle of the income distribution, this figure begins to fall, which is likely an effect of caste. There is a strong overlap between higher incomes and the likelihood of being upper caste in India. Vegetarianism is far more a feature of upper castes, particularly Brahmins, Marwaris & Jains, than of any other caste group or community.

Share of vegetarians among different caste and communities (in %)



India Human Development Survey (NCAER/ University of Maryland) 2011-12

Apart from income, culture plays an important role in dietary preferences in India – in traditional societies, milk and meat are rated as more masculine foods than vegetables, and male meat-eaters are perceived as being more masculine than vegetarians. Men are less likely than women to completely abstain from eating chicken, meat, fish, and eggs. Overall, 30 percent of women and 22 percent of men are vegetarians in India (NFHS 4 FOOD CONSUMPTION OF WOMEN AND MEN, 335). Also, Geographical location plays a significant role as the Vegetarianism varies dramatically from one state to another in India. There are seven contiguous states in which more than half of women age 15-49 years are

vegetarians. Vegetarianism is most prevalent in Haryana, Rajasthan, and Punjab, where at least three-quarters of women are vegetarians. More than half of women are also vegetarians in Gujarat, Madhya Pradesh, Himachal Pradesh, and Delhi. In 14 states, less than 10 percent of women are vegetarians. Women are more likely to be vegetarians than men in every state except for three small states in the northeast where almost no women or men are vegetarians (NFHS-3 NUTRITION REPORT). According to data from the central government's sample registration system baseline survey (SRSBS) (2014) Rajasthan has the highest number of vegetarians with 73.3% men and 76.6% women followed by Haryana with 68.5% men and 70% women. There's also a concept of Day-terians in which it's common to be a vegetarian on Tuesdays, Thursdays or Saturdays as well as occasions like the Hindu festivals of Navaratri and Rama Navami. Now a days, Personal factors included internal convictions, physical feedback, habits, convictions about the welfare of animals and their ethical values help people to maintain a vegetarian diet.

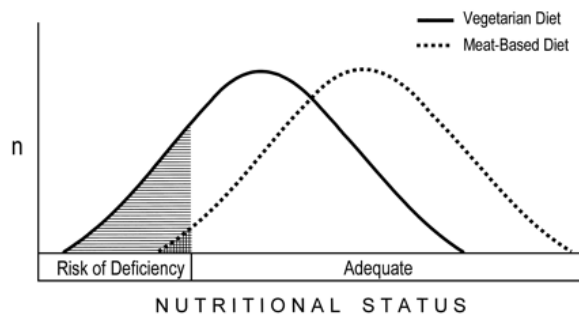
Although vegetarian diet has been shown to be associated with several health benefits in traditionally meat-eating societies, in predominantly vegetarian populations such as in India, vegetarian lifestyle may confer nutritional imbalances and consequent effects on long-term health in children and women. vegetarianism is often imposed on people, by religion or caste, ability to afford, gender etc which gives rise to nutritional deficiencies in women, and children results in malnutrition, maternal mortality, infant mortality, stunted or defective bone growth. The comprehensive National Survey (CNNS) 2016-2018, results suggest that more than half of all Indian Children are self-reported vegetarians. For the mothers of children aged 0-4, the share is closer to 45%. Within India, as is now well known, the southern and eastern states, which have better child health, as they have more meat-eaters than northern states.

As India is facing an "epidemic" of diet-related non-communicable diseases (DR-NCDs), along with widely prevalent undernutrition resulting in substantial socioeconomic burden. A decreasing intake of coarse cereals, pulses, fruits and vegetables, an increasing intake of meat products and salt, coupled with declining levels of physical activity due to rapid urbanization have resulted in escalating levels of obesity, atherogenic dyslipidemia, subclinical inflammation, metabolic syndrome, type 2 diabetes mellitus, and coronary heart disease in Indians. The nutritional profile of vegetarian and nonvegetarian diet across various regions of India is not well documented (Farmer et al., 2011), although studies have shown greater amounts of antioxidants (vitamins C, A, and E) in Indian vegetarians that may make them less prone to oxidative stress and noncommunicable diseases (Manjari et al., 2001; Somannavar and Kodliwadmth, 2012). However, some studies on the nutritional profile of Indian vegetarian diet demonstrate micronutrient deficiencies of zinc and iron that are primarily attributable to reduced absorption (Agte et al., 1994, 2005) and vitamin B12 deficiency in rural and urban vegetarians due to low dietary intake (Yajnik et al., 2006; Misra et al., 2002). A recent study (Shridhar et al., 2014) assessing the nutrition profile of the vegetarians from four different geographic regions, representing 20 states of India, with energy, socioeconomic status, and multivariate adjusted analyses of nutritional intake found that, overall, Indian vegetarian diets were found to have a greater percentage meeting recommended daily allowance (RDA) levels of macro- and micronutrients with less fat and lower calories than nonvegetarian diets.

Models on Health risks & benefits of well-balanced diet

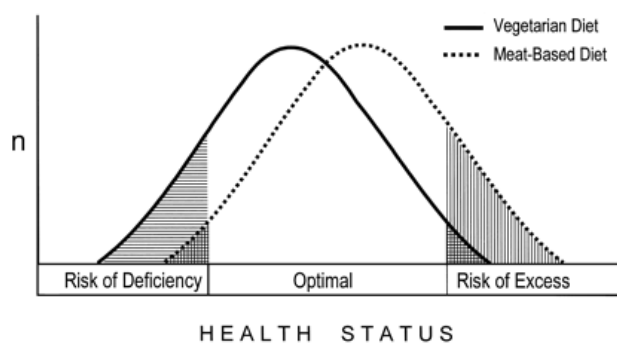
Based on different paradigms, this series of models encapsulates the evolution of scientific understanding on the overall effects of these dietary patterns on human health.

Early model of the adequacy of vegetarian diet



Early model prevailing through the 1960s on the adequacy of vegetarian diets. The area under each curve represents the proportion of individuals in a population for which a given diet may be adequate or deficient. The basic tenet of this model is that a population following a vegetarian diet is at higher risk for developing nutrient deficiency diseases than a population following a meat-based diet. This was and still is the case in poor countries, where the relation between diet and health, and particularly meat consumption and health, is confounded by protein-energy malnutrition and other poverty-related factors. Also, very restrictive or unbalanced vegetarian diets such as fruitarian diets or some macrobiotic diets may lead to nutritional deficiencies, particularly in growing children and women during the reproductive years. Parenthetically, to decrease the risk of nutrient deficiencies, those following meatless diets were advised to add generous amounts of other animal products such as eggs, milk, and dairy products to their diet. This de facto makes it a mixed diet and displaces the curve to the right. This early model used a unilateral approach to the relationship between vegetarian diets and health, because it pays attention to only the health risks and not the potential benefits (Sabate J. et al., 2001)..

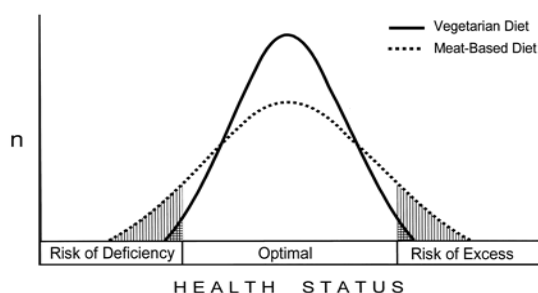
Current model



Current model prevailing from the 1970s to the present on the population health risks and benefits of vegetarian and meat-based diets. The area under each curve represents the

proportion of individuals in a population for which a given diet pattern may be a health risk or benefit (optimal). At both extremes of the health continuum, there is risk of disease for deficiency or excess of nutrients. The area in the center represents the proportion of individuals for which the diet is optimal or most beneficial. This model is likely to encourage the conclusion that no overall improvements can be accomplished if the population distribution curve is displaced to the right or left by changing the mix of plant and animal foods in the diet. If the curves moved, the same amount gained in one end would be lost at the other end (Sabate J. et al., 2001)..

Proposed new model



Proposed model on the population health risks and benefits of vegetarian and meat-based diets. The area under each curve represents the proportion of individuals in a population for which a given diet pattern may be a health risk or benefit (optimal). At both extremes of the health continuum, there is risk of disease for deficiency or excess of nutrients or other food compounds. The area in the centre represents the proportion of individuals for which the diet is optimal or most beneficial (Sabate J. et al., 2001).

VI. Conclusion

Based on above discussion, it can be reasonably concluded that the beneficial effects of a vegetarian diet significantly outweigh the adverse ones. A well-balanced vegetarian diet (which meets current recommendations for all of these nutrients, the use of supplements and fortified foods) could prevent nutrient deficiencies as well as diet-related non communicable disease (DR-NCD). It is also clear that the current scenario of food production and consumption, mainly non-vegetarian, is not environmentally sustainable. Hence, there is an urgent need to consume low carbon footprint diet (vegan or vegetarian) that have lower environmental impacts. Environmental issues such as global warming and climate change can be minimized by adopting vegetarianism or by lowering the consumption of meat and other animal-based products.

However, considering Indian's protein deficiencies as against the global recommended standard, as well as the poorer health outcomes of its vegetarian population, in India's case it may not yet be the best solution for everyone to become vegetarian. Vegetarian lifestyle may confer nutritional imbalances and consequent effects on long-term health in children. Restrictive or unbalanced diets may lead to nutritional deficiencies, particularly in situations of high metabolic demand (Growing children, pregnant women), in such case nutritionally

balanced diet or non-vegetarian diet is an important source of protein and other necessary nutrients, as India is facing widely prevalent undernutrition. In this context, government can play a vital role by enlighten the people about nutritional recommendations and associated with health promotion and saving environment.

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