



Which Is a Good Diet—Veg or Non-veg? Faith-Based Vegetarianism for Protection From Obesity—a Myth or Actuality?

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Abstract

Introduction India ranks first among nations with the largest population of vegetarians, and 40% of Asian Indians are vegetarian. There seems to occur a “nutrition transition” among vegetarians in India with a decline in the consumption of whole plant food content and replacement with processed foods, fried foods, and refined carbohydrates. This study evaluates the association between the consumption of a vegetarian diet and the prevalence of morbid obesity necessitating bariatric surgery in Asian Indians.

Material and Methods This is a retrospective cohort study analyzing records of 235 Indian patients suffering from morbid obesity and who underwent bariatric surgery at our center through the years 2015 to 2017. Pearson’s chi-square test for independence of attributes was applied to analyze the difference between a number of vegetarians versus non-vegetarians undergoing bariatric surgery.

Results The difference in the number of vegetarians versus non-vegetarians undergoing bariatric surgery was not significant for years 2015 and 2017, but the number was numerically higher for vegetarians. The difference was significantly higher for vegetarians in the year 2016. The difference in female vegetarians versus female non-vegetarians undergoing bariatric surgery was not significant for the year 2017 but was significantly higher for vegetarians during the years 2015 and 2016. The difference in male vegetarians versus non-vegetarians undergoing bariatric surgery was not significant for all the years.

Conclusion In an Asian Indian cohort, we found that vegetarian dietary patterns were associated with a higher incidence of morbid obesity culminating in bariatric surgery. Our study is a myth breaker that all vegetarian diets are healthy diets. Our findings can be utilized to discourage refined and processed food consumption and promote healthy vegetarian food choices.

Keywords Vegetarian · Non-vegetarian · Diet · Bariatric surgery · Morbid obesity · Meat · Vegan · Asian Indian

Introduction

What Is Vegetarianism?

A vegetarian is someone who consumes a diet comprising exclusively of grains, pulses, nuts, seeds, vegetables, and fruits with, or without, the use of dairy products and eggs, and does not consume any meat, poultry, fish, or by-products of slaughter. People consume vegetarian diets due to ethical, moral, cultural, religious, or political reasons. They constitute a significant minority of the world’s population.[1] But more recently, vegetarianism has become

increasingly popular among people including adolescents as this diet is believed to offer health benefits.

Uniqueness of Vegetarianism in India

Many Indians practice faith-based vegetarianism. Statistics depict that close to 40% Asian Indians are vegetarian.[2] Vegetarian practices vary widely in India ranging from abstaining from slaughtered flesh foods, fish, poultry, to roots and tubers.[3, 4] It includes lacto, pesco, and lacto-ovo vegetarian practices. Veganism is practiced by 1.6% of the Indian population.[5] As against the Western perspective of vegetarianism being a lifestyle choice adopted during adulthood, vegetarianism in India is a tradition since birth.[3] Not surprisingly, India ranks first among nations with the largest population of vegetarians, estimated to be 300–400 million. Furthermore, the high trend of vegetarianism continues to persist through

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the last 25 years, as reported by only a slight increase in the annual per capita consumption of meats in India, primarily attributable to poultry consumption.[6]

Vegetarianism and the Associated Health Implications

Worldwide, the vegetarian diet is recognized for conferring numerous health benefits. Accumulating evidences suggest the positive impact plant-based diet can have on biometric outcomes like body mass index, blood pressure, diabetes, and lipid profile. [7–11] The American Dietetic Association endorsed the concept by mentioning that appropriately planned vegetarian diets may provide health benefits including prevention of obesity.[12] But, there seems to occur a “nutrition transition” among vegetarians in India with a decline in the whole plant food content and replacement with foods having known dietary risk factors (i.e., processed foods, fried foods, and refined carbohydrates).

Rationale behind this Study

During routine clinical practice at our center, we observed a signal, contrary to popular belief, of the increasing prevalence of obesity among vegetarian Asian Indians. The question arose why morbid obesity rates and consequent bariatric surgery rates are on the rise in a nation in which vegetarianism remains common despite urbanization. To find an answer, we decided to conduct a retrospective study at our center comparing the incidence of bariatric surgery in patients consuming vegetarian viz-a-viz non-vegetarian diets. In India, the need for such a study was very important because of strong religious beliefs around vegetarianism and the changing pattern of the typical vegetarian diet. To the best of our knowledge, this is the first study conducted worldwide which reports the association between diet practices and morbidly obese status culminating in bariatric surgery.

Material and Methods

This is a retrospective cohort study analyzing records of 235 Indian patients suffering from morbid obesity and who underwent bariatric surgery at our center through the years 2015 to 2017. Anthropometric and diet-related data were collected from medical records. For the purpose of this manuscript, we considered the practice of being “vegetarian” as the avoidance of meat, poultry, and fish. Vegetarian status was obtained from medical records and/or telephone interviews. This study was performed in conformity with the Declaration of Helsinki. Since this is a retrospective observational study, an ethics committee approval was not required.

Statistical Analysis

Pearson’s chi-square test for Independence of Attributes was applied to analyze the difference between the number of vegetarians versus non-vegetarians undergoing bariatric surgery. The analysis was done for the cohort as a whole, and separately for males and females. Data was tabulated using Microsoft Excel (Microsoft Corporation, Redmond, WA, USA) and was analyzed using SPSS for Microsoft Windows, version 21.0 (SPSS, Chicago, IL, USA). $p < 0.05$ was considered statistically significant.

Results

The difference in the number of vegetarians versus non-vegetarians undergoing bariatric surgery was not significant for years 2015 and 2017. The difference was found to be significant for the year 2016, with more number of vegetarians undergoing bariatric surgery. Numerically vegetarians underwent bariatric surgery procedures through all the years, as depicted in Table 1.

The difference in the number of female vegetarians versus female non-vegetarians undergoing bariatric surgery was not significant for the year 2017. The difference was found to be significant for the years 2015 and 2016, with more number of vegetarian females undergoing bariatric surgery. Overall, vegetarian females are more prone to undergo bariatric surgery in the Indian context, as shown in Table 2.

The difference in male vegetarians versus male non-vegetarians undergoing bariatric surgery was not significant for all the years. Numerically, the values were smaller for the vegetarian male subgroup compared to non-vegetarian males, as shown in Table 3.

Highly significant difference ($p < 0.001$) was found in the number of females undergoing bariatric surgery versus the number of males undergoing bariatric surgery, through all the years (2010 to 2017). Females were significantly more likely to undergo bariatric surgery. The rough ratio of females to males undergoing bariatric surgery was 2:1 (Table 4).

Table 1 Year after year difference in vegetarian eaters versus non-vegetarian eaters undergoing bariatric surgery

Year	2015–2017			<i>p</i> value	Significance
	Veg	Non-veg	Total		
2015	54 (56.84)*	41 (43.16)	95 (100)	0.057	Not significant
2016	44 (61.11)	28 (38.89)	72 (100)	0.006	Significant
2017	36 (52.94)	32 (47.06)	68 (100)	0.492	Not significant
Total	134 (57.02)	101 (42.98)	235 (100)	0.002	Significant

*Percentage of patients, Pearson’s chi-square test for Independence of Attributes

Table 2 Year after year difference in female vegetarian eaters versus female non-vegetarian eaters undergoing bariatric surgery

Year	2015–2017			p value	Significance
	Veg F	Non-veg F	Total		
2015	41 (60.29)*	27 (39.71)	68 (100)	0.014	Significant
2016	33 (67.35)	16 (32.65)	49 (100)	<0.001	Significant
2017	30 (57.69)	22 (42.31)	52 (100)	0.112	Not significant
Total	104 (61.54)	65 (38.46)	169 (100)	<0.001	Significant

*Percentage of patients, Pearson's chi-square test for Independence of Attributes

Discussion

The phenomenon of disproportionate rise in metabolic morbidities in South Asia compared to other regions of the world despite high levels of vegetarianism was termed as “South Asian Paradox” by Jaacks et al. [13] It is not well understood whether the vegetarian diet confers a similar protective effect against obesity in Indians that has been demonstrated in western studies. With the ongoing preponderance of vegetarianism in India, this question needs to be answered. Moreover, vegetarianism in India is unique in many ways. It is usually practiced lifelong and spans across multiple generations. Hence, authors believed that the analysis of a vegetarian diet with metabolic morbidity in India may yield different findings than similar studies conducted in the West.

Our findings show that the vegetarian status did not confer any protective effect on the propensity to be morbidly obese and undergoing bariatric surgery. Our findings were contrary to the expected association between vegetarianism and reduced prevalence of morbid obesity as observed in many western studies. No other study has dealt with morbid obesity culminating in bariatric surgery until now. Hence, our study fulfills an important need gap.

The study by Ball and Bartlett [14] reported that vegetarians had significantly higher intakes of dietary fiber and vitamin C and significantly lower intakes of protein, saturated fat, and cholesterol. Furthermore, Appleby et al. [1] reported that

Table 3 Year after year difference in male vegetarian eaters versus males non-vegetarian eaters undergoing bariatric surgery

Year	2015–2017			p value	Significance
	Veg M	Non-veg M	Total		
2015	13 (48.15)*	14 (51.85)	27 (100)	0.785	Not significant
2016	11 (47.83)	12 (52.17)	23 (100)	0.768	Not significant
2017	6 (37.5)	10 (62.5)	16 (100)	0.144	Not significant
Total	30 (45.45)	36 (54.55)	66 (100)	0.294	Not significant

*Percentage of patients, Pearson's chi-square test for Independence of Attributes

Table 4 Year after year comparison of number of females undergoing bariatric surgery versus males undergoing bariatric surgery

Year	2010–2017			p value	Significance
	Female	Male	Total		
2010	58 (61.7)*	36 (38.3)	94 (100)	0.001	Significant
2011	93 (65.96)	48 (34.04)	141 (100)	<0.001	Significant
2012	90 (65.22)	48 (34.78)	138 (100)	<0.001	Significant
2013	55 (68.75)	25 (31.25)	80 (100)	<0.001	Significant
2014	55 (67.9)	26 (32.1)	81 (100)	<0.001	Significant
2015	68 (71.58)	27 (28.42)	95 (100)	<0.001	Significant
2016	49 (68.06)	23 (31.94)	72 (100)	<0.001	Significant
2017	52 (76.47)	16 (23.53)	68 (100)	<0.001	Significant
Total	516 (67.1)	253 (32.9)	769 (100)	<0.001	Significant

*Percentage of patients. Z test for equality of proportion

vegetarians have a lower prevalence of overweight and obesity compared with non-vegetarians. The study by Farmer et al. [15] suggested that vegetarian diets may be better for weight management and vegetarians were slimmer than their meat-eating counterparts. The authors concluded that vegetarian diets may be recommended for weight management without compromising diet quality. Berkow and Barnard [16] reviewed 87 published studies and concluded that a vegan or vegetarian diet is highly effective for weight loss. They also reported that vegetarians have a lower propensity of comorbidities like heart disease, high blood pressure, diabetes, and obesity. They further stated that weight loss in vegetarians is not dependent on exercise. Further, Sabaté and Wien [17] reviewed the relationship between vegetarian diets and obesity, particularly as they relate to childhood obesity. They concluded that compared with non-vegetarians, vegetarian children are leaner, and their BMI difference becomes greater during adolescence.

The difference in results between our study and studies conducted in the west needs explanation. The term “vegetarian” and the approach to ascertaining vegetarian status differs based on seeking dietary history, interpretation by health care professional or how is it self-reported in the Indian context and it may be one of the reasons for our contrasting results. For instance, vegans in western countries do not consume dairy or dairy products and also refrain from honey which is not the case for Indian vegans; Indian vegetarians consume a significant portion of butter, ghee, and honey in their diet. Secondly, since vegetarians in India have not taken up vegetarianism for health-conscious or political reasons, it is likely that higher incidence of snacking and snack food availability, higher meal frequency, practice of away-from-home eating in restaurants and fast food outlets, and overall increase in the consumption of fried and processed food might be attributable. Third, there may exist biological differences between Western vegetarians

and Indian faith-based vegetarians. Fourth, the practice of consuming red meat and processed meat is not very common among the non-vegetarians in India. If interpreted causally, the results might suggest either that the potential beneficial effects of the elimination of red and processed meats by Western vegetarians are negated by the consumption of refined and processed foods in vegetarian diets by Asian Indians or that their meat avoidance is not beneficial. However, such divergent findings seem difficult to fully explain in a single center retrospective analysis.

Similar to our study, two other studies conducted in Indians have linked vegetarianism with higher obesity, and our findings build on this work by demonstrating a higher number of vegetarian patients undergoing bariatric surgery over 3 years at our center. Singh et al. [18] reviewed the epidemiologic evidence from Asian Indians enrolled in the Adventist Health Study 2. They reported about the emergence of an obesity epidemic in urban and rural India and the role of a “nutrition transition” in decreasing the whole plant food content of diets in India and the increasing risk of obesity. Misra et al. [19] evaluated the incidence of diabetes, obesity, and metabolic syndrome in the ethnic group of Asian Indians who settled in the USA, who have often followed plant-based diets. They reported that a vegetarian lifestyle was a protective factor and lowered the risk for diabetes but not for metabolic syndrome and obesity as depicted in the regression model. Our study serves the purpose of replicating prior results in a population with greater geographic and ethnic diversity.

Men and women manifested different patterns year-after-year in our study. Effects were generally stronger and more significant in women than men. Likely, the explanation could be that females have a higher propensity to undergo bariatric surgery compared to males, and the female subgroup is well-powered to provide more conclusive results. The difference is less likely to result from any dietary difference between men and women. Also, the biological effect of dietary factors on obesity may be different in men and women. Future analysis may investigate gender-specific mechanisms.

a. Limitations

This study has certain limitations which should be considered when reviewing the results. First, we could not ascertain the exact dietary composition of patients included in the study. Second, the dietary patterns may change over time, and there may have been patients who recently adopted vegetarianism or otherwise. Whereas, the analysis relies on a single measurement of diet at baseline. Third, we could not evaluate the association of other types of vegetarianism like pesco-vegetarian, vegan, and lacto-ovo-vegetarian diets compared with the non-vegetarian diet.

b. Future Prospects

There is an immense potential to further sub-investigate the food choices within a dietary pattern that can make or mar the health benefits associated with the vegetarian practice. Plans for future research include enhancing data collection to include the variants of vegetarian diets and taking a closer look at its macronutrient and micronutrient composition. An understanding of these predictors can help target public health messages.

Conclusion

With an increasing number of people adopting vegetarian lifestyles and as large proportion of Indians subsist on vegetarian diets for religious, economic, and cultural reasons, bariatric surgeons will encounter more patients who are vegetarians and yet candidates of bariatric surgery. Prior literature has reported that vegetarians have a better metabolic profile than non-vegetarians. In a large Asian Indian cohort, we found that vegetarian dietary patterns were associated with a higher incidence of morbid obesity culminating in bariatric surgery. Our study is a myth breaker that all vegetarian diets are healthy diets. Our findings on the inverse association between vegetarianism and morbid obesity can be considered by bariatric surgeons and healthcare policy makers to discourage refined and processed food consumption and promote healthy vegetarian food choices. It provides an opportunity to address the national epidemic of obesity by restraining the marketing and consumption of unhealthy non-vegetarian foods, especially to a vulnerable population like the adolescents. Bariatric surgeons must target customized nutrition intervention across different stages of lifespan so that healthy eating pattern habits are inculcated at an early age. Further, this needs to be emphasized via public health and nutrition interventions at the level of governments, mass media, and food industry.

Compliance with Ethical Standards

Conflict of Interest The authors declare that they have no conflict of interest.

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References

1. Appleby PN, Key TJ. The long-term health of vegetarians and vegans. *Proc Nutr Soc.* 2016;75(3):287–93. <https://doi.org/10.1017/S0029665115004334>.

2. FAO/STAT. Food and Agriculture Organization of the United Nations, statistical database. Available from: <http://faostat.fao.org/> (accessed 26.5.18).
3. Raj S. The practice of vegetarianism in the South Asian sub-continent. *Vegetarian Nutrition Update*. 2011;XX(1):1–5.
4. Payyappallimana U, Venkatasubramanian P. Exploring Ayurvedic knowledge on food and health for providing innovative solutions to contemporary healthcare. *Front Public Health*. 2016;4:57. <https://doi.org/10.3389/fpubh.2016.00057>.
5. Agrawal S, Millett CJ, Dhillon PK, et al. Type of vegetarian diet, obesity and diabetes in adult Indian population. *Nutr J*. 2014;13(1):89. <https://doi.org/10.1186/1475-2891-13-89>.
6. FAO. World agriculture: towards 2015/2030. An FAO perspective. Available from: <http://www.fao.org/docrep/005/y4252e/y4252e05c.htm> (accessed 26.5.18).
7. Craig WJ. Health effects of vegan diets. *Am J Clin Nutr*. 2009;89(suppl):1627S–33S.
8. Smith MV. Development of a quick reference to accommodate vegetarianism diet therapy for multiple disease conditions. *Am J Clin Nutr*. 1988;48:906–9.
9. Barnard ND, Weissinger R, Jaster BJ, et al. *Nutrition Guide for Clinicians*. 2nd ed. Washington, DC: Physicians Committee for Responsible Medicine; 2009.
10. Bodkin C. Alternative therapies for the holistic care of HIV/AIDS patient. *Health SA Gesondheid*. 2003;8(3):37–46.
11. Beezhold BL, Johnston CS, Daigle DR. Vegetarian diets are associated with healthy mood states: a cross-sectional study in Seventh Day Adventist adults. *Nutr J*. 2010;9(26):1–7.
12. American Dietetic Association. Position of the American Dietetic Association: vegetarian diets. *J Am Diet Assoc*. 2009;7:1266–82.
13. Jaacks LM, Kapoor D, Singh K, et al. Vegetarianism and cardiometabolic disease risk factors: differences between South Asian and American adults. *Nutrition (Burbank, Los Angeles County, Calif)*. 2016;32(9):975–84. <https://doi.org/10.1016/j.nut.2016.02.011>.
14. Ball MJ, Bartlett MA. Dietary intake and iron status of Australian vegetarian women. *Am J Clin Nutr*. 1999;70:353–8.
15. Farmer B, Larson BT, Fulgoni 3rd VL, et al. A vegetarian dietary pattern as a nutrient-dense approach to weight management: an analysis of the national health and nutrition examination survey 1999–2004. *J Am Diet Assoc*. 2011;111(6):819–27. <https://doi.org/10.1016/j.jada.2011.03.012>.
16. Berkow SE, Barnard N. Vegetarian diets and weight status. *Nutr Rev*. 2006 Apr;64(4):175–88. <https://doi.org/10.1111/j.1753-4887.2006.tb00200.x>.
17. Sabaté J, Wien M. Vegetarian diets and childhood obesity prevention. *Am J Clin Nutr*. 2010;91(5):1525S–9S. <https://doi.org/10.3945/ajcn.2010.28701F>.
18. Singh PN, Arthur KN, Orlich MJ, et al. Global epidemiology of obesity, vegetarian dietary patterns, and noncommunicable disease in Asian Indians. *Am J Clin Nutr*. 2014;100(1):359S–64S. <https://doi.org/10.3945/ajcn.113.071571>.
19. Misra R, Balagopal P, Raj S, et al. Vegetarian diet and cardiometabolic risk among asian indians in the United States. *J Diabetes Res*. 2018;2018:1675369):13. <https://doi.org/10.1155/2018/1675369>.