

Does the type of diet influence Diabetes Mellitus Type 2, Hypertension and Cardiovascular Diseases



BIOCHEMISTRY

KEYWORDS : vegan, lacto-vegetarian, lacto-ovo-vegetarian, pesco-vegetarian, hypertension, type-2 diabetes mellitus

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ABSTRACT

Aims and Objectives: Dietary pattern may enhance or decrease the risk factors associated with cardiovascular and metabolic diseases. The objective of this study was to assess the effects of different vegetarian diets on type 2 diabetes mellitus, hypertension and cardiac diseases.

Materials and Methods: Consumption of selected food items were assessed by a questionnaire. Does who were diabetic, hypertensive or had cardiovascular disease were also assessed by a questionnaire and compared by blood pressure measurements, tests for fasting and post-prandial plasma glucose and ECG.

Results: No significant numbers of diabetics, hypertensives or heart disease patients were found in the vegan, lacto-vegetarian, lacto-ovo-vegetarian, pesco-vegetarian type but quite a number of diabetics (24.64%), hypertensives (19.57%) and heart disease (6.52%) patients were found in the non-vegetarians.

Conclusions: Compared to non-vegetarian diets, vegan diet, lacto-vegetarian diets, lacto-ovo-vegetarian diets and pesco-vegetarian diets seem to offer additional protection for hypertension, type-2 diabetes mellitus and cardiovascular diseases

INTRODUCTION:

For many individuals, the choice for adopting a vegetarian diet stems from various reasons including religious and ethical considerations (Krey, 1982), environmental impacts (Carlsson-Kanyama and Gonzalez, 2009; Fox and Ward, 2008), and health benefits of a plant-based diet (Craig and Mangels, 2009). There are strong correlations between diabetes mellitus and changes in body composition components (Banerji et al, 1999; Goodpaster et al, 2003; Lopatynski et al, 2003; Nigam et al, 2003).

A vegan diet excludes all animal products—notably, dairy, eggs, and meats. Veganism is the practice of abstaining from the use of animal products, particularly in diet. Those committed to long-term veganism are typically well versed in the need to combine plant foods to achieve complete protein and in the role of select nutrient supplements (Craig, 2009). In addition to the requirements of a vegetarian diet, vegans do not eat food produced by animals, such as eggs, dairy products, or honey. Lacto vegetarianism is a vegetarian diet that includes certain types of dairy, but excludes eggs and foods which contain animal rennet (Fiona, 2011). A common diet among followers of several religions, including Hinduism and Jainism, based on the principle of Ahimsa (non-harming). Ovo vegetarianism is a type of vegetarianism which allows for the consumption of eggs but not dairy products like lacto vegetarians. Lacto-ovo vegetarianism is a vegetarian diet that includes eggs and dairy. Pescetarianism (also spelled pescatarianism) is the practice of following a diet that includes fish or other seafood, but not the flesh of other animals (Merriam Webster, 2012).

When attention is directed to nutritionally replete, low-fat, plant-based diets, the literature lends strong support for favourable effects across a wide array of health outcomes (Alrabadi, 2012); (Best and Grainger, 2007); (Katz, 2008); (McEvoy et al, 2012); (Pettersen et al, 2012); (Phillips et al, 2008); (Tantamango-Bartley et al, 2013); (Tonstad et al, 2013). There is no decisive evidence that low-fat eating is superior to diets higher in healthful fat in terms of health outcomes over the life span. When food choices are judicious in both contexts, the superiority of fat-restricted versus carbohydrate restricted eating for weight loss and health is not reliably established (Foster et al, 2010); (Hu et al, 2012); (Kones, 2010).

The aim of this review is to assess the health and disease outcomes of vegetarian diets and non-vegetarian diets with regards to chronic diseases, especially type 2 diabetes mellitus, hypertension and cardiovascular diseases. Are the health effects of those who adhere to strict vegetarian (i.e., vegan) and lacto-ovo-

vegetarian diets differ from non-vegetarians?

MATERIALS & METHODS

A total of four hundred and fifty persons, including males and females, took part in the study. The study followed the recommendations of the Declaration of Helsinki, 2000 (World Medical Association, 2000). All participants were informed about the study procedures. Consumption of selected food item was assessed by asking, 'How often do you yourself consume the following food items: daily, weekly, occasionally or never?' related to the consumption of milk or curd, pulses or beans, dark green leafy vegetables, fruits, eggs, fish, chicken or meat. Based on the frequency of consumption, vegetarian status (Snowdon and Phillips, 1985); (Key et al, 1999); (Famodu et al, 1998); (Agrawal et al, 2014) was categorized by defining vegans as subjects who reported never consuming animal products (chicken or meat, fish, eggs, milk or curd); lacto-vegetarian as those who reported consuming fruits, vegetables, pulses or beans, milk or curd, either daily, weekly or occasionally but no fish, eggs or chicken or meat; lacto-ovo vegetarian as those who reported consuming fruits, vegetables, pulses or beans, milk or curd, and or eggs either daily, weekly or occasionally but no fish or chicken or meat; pescovegetarian: who reported consuming fruits, vegetables, pulses or beans, milk or curd, and or eggs or fish either daily, weekly or occasionally but no chicken or meat ; non-vegetarian: who reported consuming fruits, vegetables, pulses or beans, animal products (chicken or meat, fish, eggs, milk or curd) either daily, weekly or occasionally.

After that, each participant underwent a structured examination, which included an interview. Height, weight, waist circumference (WC) and hip measurements and a fasting venipuncture. Height and weight were measured to the nearest 0.5 cm and 0.1 kg, respectively. BMI was calculated as weight (kilogram) divided by height (in meter) squared. WC was determined to the nearest 0.1 cm using a measuring tape positioned at the midpoint between the lowest rib and the iliac crest and hips were measured at the largest gluteal circumference. These measurements were used to calculate the waist-to-hip ratio (WHR). Then, blood pressure was measured using a standard mercury sphygmomanometer. The diagnosis of DM was based on WHO criteria (American Diabetes Association, 2004), i.e. a fasting plasma glucose level > 7.0 mmol/L or > 126 mg/dL, or a 2-h postprandial plasma glucose level > 11.1 mmol/L or > 200 mg/dL on more than one occasion, with symptoms of diabetes.

Statistical analysis

All data are presented as mean ± standard deviation and were analyzed using Graphpad prism version 5. Differences between two groups were analysed by Student t test, while multiple groups were compared using ANOVA. A P < 0.05 was considered statistically significant.

RESULTS

Out of 450 participants, 104 were vegans, 64 were lacto-vegetarians, 60 were lacto-ovo-vegetarians, 84 were pesco-vegetarians and 138 were non-vegetarians.

The mean age of the participants (in years) was 44±17 in vegans, 45±18 in lacto-vegetarians, 42±13 in lacto-ovo-vegetarians, and 49±21 in pesco-vegetarians and 43±19 in non-vegetarians. The male: female sex ratio was almost the same in all the groups. The mean BMI values did not vary significantly among the five groups (BMI of vegans was 24±5.1, for lacto-vegetarians it was 25±5.7, for lacto-ovo-vegetarians it was 26±3.9, for pesco-vegetarians it was 28.05±4.42 and for non-vegetarians it was 28±5.8) as shown in table 1. No great variation was seen in the waist to hip ratio also; for vegans it was 1.01±0.8, for lacto-vegetarians it was 0.98±0.06, for lacto-ovo-vegetarians it was 1.01±0.9, for pesco-vegetarians it was 1.03 ± 0.07 and for non-vegetarians it was 1.04±0.17. No variation in tobacco consumption was seen amongst the groups but more alcohol consumption was seen amongst the no-vegetarian group.

Table 1: Characteristics of the participants involved in the study.

	Vegan	Lacto-vegetarian	Lacto-ovo vegetarian	Pesco-vegetarian	Non-vegetarian
Mean age in years	44±17	45±18	42±13	49±21	43±19
Sex (M: F in %)	45:55	43:57	46:54	48:52	47:53
BMI (kg/m ²)	24±5.1	25±5.7	26±3.9	28.05±4.42	28±5.8
Waist to hip ratio	1.01±0.8	0.98±0.06	1.01±0.9	1.03 ± 0.07	1.04±0.17
Tobacco smoking	6	4	3	7	6
Alcohol consumption	2	2	1	2	22

Table 2: Type of diet and its relationship with type 2 diabetes mellitus, hypertension and cardiovascular diseases.

Characteristics	Type of diet					
	Vegan N (%)	Lacto-vegetarian N (%)	Lacto-ovo vegetarian N (%)	Pesco-vegetarian N (%)	Non-vegetarian N (%)	P-value
Type 2 Diabetes Mellitus	4(3.85)	5(7.81)	7(11.67)	4(4.76)	34(24.64)	< 0.05
Hypertension	3(2.88)	3(4.69)	2(3.33)	1(1.19)	27(19.57)	< 0.05
1 or >1 episode of angina pectoris /heart disease	Nil	1(1.56)	1(1.67)	Nil	9(6.52)	< 0.05
Combination of diabetes and hypertension	Nil	Nil	1(1.67)	Nil	4(2.9)	< 0.05

Combination of diabetes and 1 or >1 episode of angina pectoris /heart disease	Nil	1(1.56)	Nil	Nil	4(2.9)	< 0.05
Combination of hypertension and 1 or >1 episode of angina pectoris /heart disease	Nil	Nil	2(3.33)	Nil	4(2.9)	

Table 2 gives the prevalence of diabetes, hypertension, 1 or >1 episode of angina pectoris /heart disease or combinations by types of diet consumption. No apparent trend in diabetes prevalence based on vegan, lacto-vegetarian, lacto-ovo-vegetarian, pesco-vegetarian type. Similarly, no significant numbers of hypertensives or heart disease patients were found in the vegan, lacto-vegetarian, lacto-ovo vegetarian, pesco-vegetarian type but quite a number of hypertensives (19.57%) and heart disease (6.52%) patients were found in the non-vegetarians.

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DISCUSSIONS

Clifton and Nestel suggest that the type of diet has little influence over levels of serum cholesterol, which the authors state are determined nearly exclusively by metabolic activity (expression of genetic load), age and gender (Clifton and Nestel, 1992). However, lower levels of blood lipids have been found in individuals who consume a vegetarian diet in comparison to those who eat meat (Coulston, 1999); (Szeto et al, 2004). Key et al. analysed five prospective studies involving 76,172 male and female vegetarians and non-vegetarians with similar lifestyles; a comparison of causes of death revealed that death by ischemic heart disease was 24% lower among vegetarians and even lower among lacto-ovo vegetarians (Key et al, 1999). The lower risk of cardiovascular disease among vegetarians may be partially explained by the lower levels of cholesterol in these individuals (De Biase et al, 2007). Arterial hypertension is one of the most important risk factors for the development of coronary artery disease and diet plays an important role in its aetio-pathogenesis. A vegetarian diet seems to have a hypotensive effect: when normotensive and hypertensive non-vegetarians change to a vegetarian diet, they experience a reduction in blood pressure levels (Sciarrone et al, 1993).

Evidence from a number of other observational studies shows that certain dietary constituents are associated with protection against diabetes through the pathway of insulin sensitivity which is also confirmed through food trials (Jenkins et al, 2003). A reduced risk of chronic disease has been reported in populations of vegetarians living in affluent countries (Orlich et al, 2013); (Tantamango-Bartley et al, 2013); (Willett, 1999). Whole grain is also a potential contributor to reduced diabetes risk in vegetarians and accumulating evidences from various prospective studies (both in men and women) and several meta-analyses shows that consumption of whole grains may reduce risk of chronic diseases including type 2 diabetes (Liu et al, 2000); (Meyer et al, 2000); (Fung et al, 2002); (Montonen et al, 2003); (Van Dam et al, 2006); (Ye et al, 2012); (Aune et al, 2013). Eating certain kinds of fish raises HDL levels (Nestel, 2000); (Sacks et al, 1994) and some fish are a convenient source of omega-3 fatty acids (Frank et al, 2002), and have numerous health benefits in one food va-

riety. A 1999 meta-analysis of five studies comparing vegetarian and non-vegetarian mortality rates in Western countries found that in comparison with regular meat-eaters, mortality from ischemic heart disease was 34% lower in pescetarians, 34% lower in ovo-lacto vegetarians, 26% lower in vegans and 20% lower in occasional meat-eaters (Collaborative analysis of 5 prospective studies, 1999). The notion that animal protein stimulates insulin secretion and possibly insulin resistance was proposed decades ago (Chaussain et al, 1980). Red and processed meat consumption has been associated with increased risk of type 2 diabetes in a large number of cohort studies in the west (Van Dam et al, 2002); (Aune et al, 2009); (Inter Act Consortium, 2013). Meat intake was associated with a higher risk of diagnosed diabetes in a study in Seventh-Day Adventists (Snowdon et al, 1985). Several other studies around the globe have also reported an increased risk of diabetes or type 2 diabetes with a higher intake of processed meat (Schulze et al, 2003); (Song et al, 2004); (Pan et al,

2013); (Villegas et al, 2006); (Simmons et al, 2007), red meat (Lee et al, 2004); (Schulze et al, 2007) and total meat (Hodge et al, 2007), but in some studies the results have been inconsistent. A recent study by Gul et al. have shown that serum cholesterol levels were also seen higher among non-vegetarians as compared to vegetarians (Gul et al, 2010).

CONCLUSIONS

Compared to non-vegetarian diets, vegan diets seem to provide some added protection against hypertension, type-2 diabetes, and cardiovascular mortality. At present, there are limited prospective data on vegetarian dietary patterns, body weight change, diabetes mellitus and cardiovascular diseases. In general, the protective effects of vegetarian diets are stronger in humans.

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