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Original Research Article.

Body Fat Percentage in a Vegetarian and Non-Vegetarian Population and Prevalence of Essential Hypertension and Type-2 Diabetes Mellitus: A Comparative Investigation in Indian Population

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ABSTRACT

Introduction: Body fat percentage (BFP) is more reliable method as compared to BMI for assessing the risk of developing disease. Essential hypertension and Type-2 diabetes mellitus are both associated with adiposity. We find out the association, of raised BFP levels in strict-vegetarians and comparatively analyzed with non-vegetarians in context to the indicated diseases.

Materials and Methods: The present study included hypertensive patients as cases and normotensive individuals as controls. We carried out a population based, random and cross sectional study. Total N= 560 subjects (295 males and 265 females) were selected randomly – after screening, n= 310 from vegetarian population and n= 250 from non-vegetarian population. Chi squired p-values < 0.05 were considered significant.

Results: The comparative analysis of the normal and raised levels of BFP among the vegetarian and non-vegetarian cohort generated a non-significant. Comparative analysis for the presence of the diabetes mellitus among both the vegetarian and non-vegetarian cohorts with raised BFP also gave a non-significant.

Conclusion: Non-vegetarian cohorts showed a non-significant association to produce essential hypertension and type-2 diabetes mellitus.

Keywords: Hypertensive, Type-2 Diabetes Mellitus, Body Fat Percentage.

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INTRODUCTION

The European Prospective Investigation Study (EPIC-Oxford) found that mean BMI was highest in meat-eaters, lowest in vegans, and intermediate in fish-eaters and vegetarians.[1]

In India, cardiovascular disease (CVD) accounts for 53.5% of NCD mortality,[2] and cardiovascular risk factors, which were initially confined to more affluent strata with inappropriate diet and lack of physical activity,[3] are becoming more common among middle and lower socioeconomic strata of Indian urban and rural populations.[4-6]

To address the global burden of NCD's, the World Health Organization's (WHO) key messages to prevent heart attacks and strokes include 1) abstinence from tobacco, 2) a healthy, low sodium diet with at least five servings of fruits and vegetables and salt, 5 mg/day; and 3) moderate/vigorous physical activity of 30 minutes/day for five days a week.[7] For cardiovascular health, the global debate continues on the most prudent diet,[8,9] which include but are not restricted to the Dietary Approaches to Stop Hypertension (DASH), Mediterranean and Japanese diets.[9]

Studies from Western countries suggest that vegetarian diets may have a protective role against the development of obesity and diabetes.[10-14]

In the Nurses' Health Study, intake of red meat and processed meats were associated with increased risk of diabetes.[15] In Seventh-day Adventist cohort studies initiated in the 1960s–1970s, diabetes was less prevalent in vegetarian than in semi-vegetarian (those who ate fish and poultry, but <1 time/wk) or non-vegetarian church-goers and processed meat eaters.[14,15] These observational findings are also supported by experimental data which have shown that the selection of foods found in vegetarian diets may carry metabolic advantages for the prevention of type 2 diabetes.[16] India is experiencing an alarming increase in the prevalence of type 2 diabetes.[16-19] the resulting morbidity, economic costs, reduced quality of life, and risk for complications make preventive strategies imperative. The contribution of the Indian diet to the increasing prevalence of diabetes in the country is not well understood.

In this study, our main aim was to compare the elevated body fat percentage levels in the strict-vegetarian and non-vegetarian cohorts in context to the presence of essential hypertension and type-2 diabetes mellitus. To achieve this aim we carried out this study based on the objectives for observing the subjects with the normal and raised levels of the body fat percentages, prevalence of normotensives and hypertensives; and the normoglycemic and diabetics in both cohorts.

MATERIALS AND METHODS

The present study included hypertensives patients as cases and normotensive individuals as controls. Consent form was taken from all the participants. In case of children, guardian's signature or thumb impression was also obtained. The strict vegetarians in this case due to social and religious reasons did not consume eggs, fish, sea foods and meat of any kind since birth.

Inclusion Criteria: Individuals from both genders i.e. males and females from 10 years to 82 years of age. We recruited the lower age group down to 10 years so as to look at the presence of hypertension in the young age group.

Exclusion Criteria: We excluded the subjects below 10 years of age due to the less incidence of hypertension. We excluded all the subjects who were not willing to continue study.

We recruited subjects from both the populations and recorded the demographic and anthropometric data, presence of essential hypertension (EHTN) and co-morbidities (i.e. diabetes, stroke and ischemic heart disease). We carried out a population based, random and cross sectional study. Total N= 560 subjects (295 males and 265 females) were selected randomly – after screening, n= 310 from vegetarian population and n= 250 from non-vegetarian population. Sample size was calculated statistically with confidence level of 95% by assuming 20% prevalence of hypertension among our study population; and we have also incorporated 10% design effect in sample size. We Performed analysis for prevalence of EHTN in the total population and calculated the prevalence of EHTN in both cohorts. We calculated the body fat percentage by using the Deurenberg formula for both sexes and performed a comparative analysis of the association of the vegetarian diet and non-vegetarian diet with the EHTN and T2DM. We recorded height, weight; and the blood pressure by taking three blood pressure measurements from the left arm at 15-minute intervals in the resting state from each participant. Any individual with systolic blood pressure >140mmHg and diastolic blood pressure >90mmHg on all the three occasions was diagnosed and labelled as hypertensive.

The subjects were labelled as normo-glycemic or diabetic by looking at the clinical and the lab investigation reports and the physician's consultation files. The levels of the fasting sugar >110mg/dL and the two hours post prandial random blood sugar levels > 180mg/dL were considered abnormal/raised. The fasting sugar levels between 110mg/dL and 125mg/dL were considered as pre-diabetic and the fasting glycaemia > 125mg/dL was taken as a definite case of diabetes mellitus. Calculation of the BMI was done by using the formula given in WHO Website for Global Database on BMI viz.

The data was analyzed descriptively and categorically by using the statistical software SPSS-21. Chi squired p-values < 0.05 were considered significant.

Table 1: Basic variables related to the vegetarian and non vegetarian

	Characteristics		P value
	Veg.	**Non Veg.**	
Participants	310 (55.3%)	250 (44.6%)	0.231
BFP in Veg & Non-Veg	**Veg**	**Non veg**	
(<20 / <25)	76 (24.5%)	59 (23.6%)	0.189
(>20 / >25)	231 (74.5%)	156 (62.4%)	
BFP Gender wise	**Males**	**Females**	
(<20 / <25)	18(5.80%)	131 (52.4%)	0.12
(>20 / >25)	265 (85.4%)	120 (48%)	
Essential Hypertension;	**Males**	**Females**	
Yes	42 (13.5%)	38 (15.2%)	0.114
No	250 (80.6%)	224 (89.6%)	
T2DM Gender wise	**Males**	**Females**	
Yes	29 (9.35%)	15 (6%)	0.453
No	268 (86.4%)	230 (92%)	

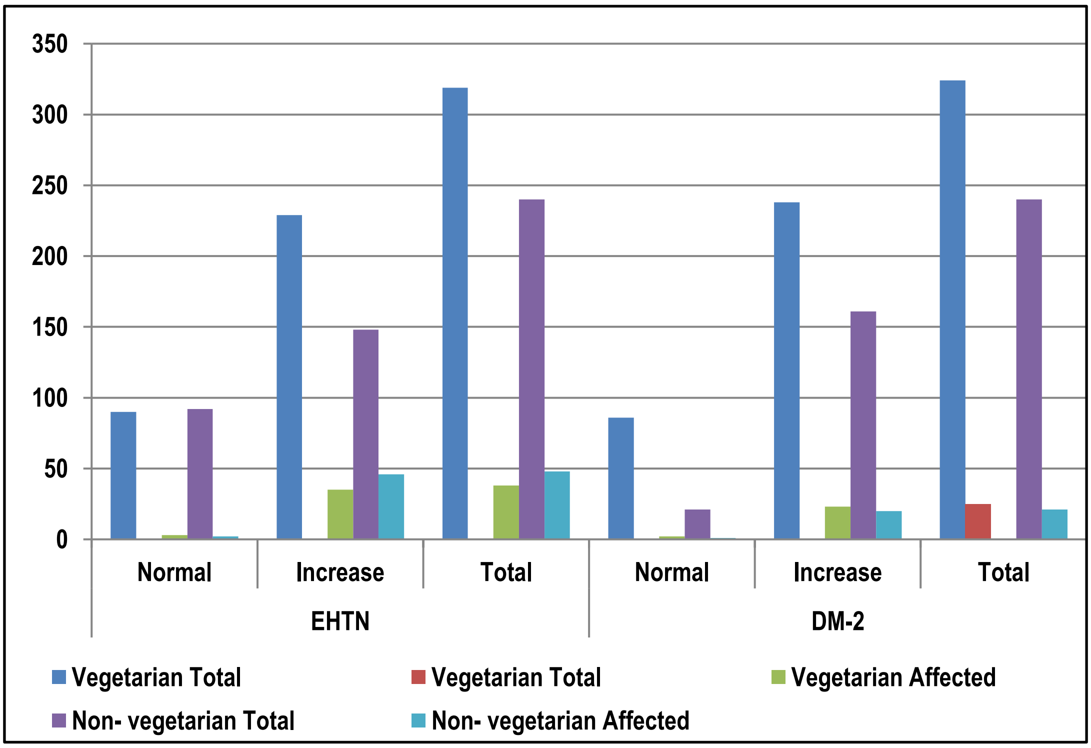
Table 2: Distribution of Body Fat Percentage (BFP) as Normal and Raised in the studied population

Body Fat Percentage (BFP)		Frequency	(%)
Total population	**Normal**	146	27.03
N=540	**Increase**	394	72.9
Males	**Normal**	19	6.8
N=278	**Increase**	259	93.1
Females	**Normal**	120	45.8
N=262	**Increase**	142	54.1
Vegetarian	**Normal**	68	22.07
N=308	**Increase**	240	77.9
Non-vegetarian	**Normal**	67	27.01
N=248	**Increase**	181	72.9

Table 3: Analysis of prevalence of essential hypertension and type-2 diabetes mellitus in normal and raised status of body fat percentage (BFP) in vegetarian and non-vegetarian subjects

Body fat Percentage		Vegetarian		Non- vegetarian		P value
		Total	Affected	Total	Affected	
EHTN	**Normal**	90	3	92	2	0.219
	Increase	229	35	148	46	0.114
	Total	319	38	240	48	0.431
DM-2	**Normal**	86	2	21	1	0.621
	Increase	238	23	161	20	0.439
	Total	324	25	240	21	0.117

Figure 1: Analysis of prevalence of essential hypertension and type-2 diabetes mellitus in normal and raised status of body fat percentage (BFP) in vegetarian and non-vegetarian subjects



RESULTS

We carried out a population based, random and cross sectional study. Total N= 560 subjects (295 males and 265 females) were selected randomly – after screening, n= 310 from vegetarian population and n= 250 from nonvegetarian population. BFP (<20 / <25) in veg was24.5% and non-veg was 23.6%, and BFP (<20 / <25) in Veg 74.5% and 62.4% in Non vegetarians. The comparative analysis of the normal and raised levels of BFP among the vegetarian and non-vegetarian cohort generated a non-significant (Table 1). Distribution of Body Fat Percentage (BFP) as Normal and Raised in the studied population was shown in table 2. Comparative analysis of prevalence of essential hypertension in the vegetarians and non-vegetarians with the status of BFP values was carried out. Similarly the raised values of the BFP were positively associated with type-2 diabetes mellitus. Comparative analysis of vegetarian versus non-vegetarian cohorts with the association of raised BFP status in context to EHTN was carried out; it generated non-significant p-Values (Table 3). Comparative analysis for the presence of the diabetes mellitus among both the vegetarian and non-vegetarian cohorts with raised BFP also gave a non-significant (Table 3, Figure 1).

DISCUSSION

The clinical detection of obesity is of immense importance due to these reasons as well as due to its psycho-social, national health and cost perspectives in patient care related to the management of its complications. The obesity is associated with increased risk of diabetes, hypertension, heart disease, stroke, cancer, dyslipidaemias, liver and gallbladder disease; sleep apnoea and respiratory problems, osteoarthritis, abnormal menses and infertility.[20] With increasing age, the prevalence of overweight and obesity is also increasing in elderly people who, as expected, are more prone to diseases.[21]

In present study we were selected randomly – after screening, n= 310 from vegetarian population and n= 250 from nonvegetarian population. BFP (<20 / <25) in veg was24.5% and non-veg was 23.6%, and BFP (<20 / <25) in Veg 74.5% and 62.4% in Non vegetarians. The comparative analysis of the normal and raised levels of BFP among the vegetarian and non-vegetarian cohort generated a non-significant p- Value (Table 1). Distribution of Body Fat Percentage (BFP) as Normal and Raised in the studied population was shown in table 2. Comparative analysis of prevalence of essential hypertension in the vegetarians and non-vegetarians with the status of BFP values was carried out.

Similarly the raised values of the BFP were positively associated with type-2 diabetes mellitus. Comparative analysis of vegetarian versus non-vegetarian cohorts with the association of raised BFP status in context to EHTN was carried out; it generated non-significant p-Values (Table 3). But comparative analysis for the presence of the diabetes mellitus among both the vegetarian and non-vegetarian cohorts with raised BFP also gave a non-significant p-Value (Table 3, Figure 1). The BMI has been mentioned usually as a sensitive parameter to assess the risk of morbidity and mortality; but BMI by itself has less significance than the body fat percentage because it is the amount of fat itself which is more related to mortality and morbidity. Moreover, the young male and female adults may have the similar values of BMI as those observed in older subjects so the body fat percentage is more reliable indicator and notable risk factor as compared to BMI.[22] Relative obesity increases with advancement in age but, the underlying mechanisms for this are not yet fully understood.[23]

Looking at the findings obtained from both of these cohorts, two things should be noted with an obviously great importance i.e. doing exercise and curtailing the caloric intake to moderate levels for achieving a normal and healthy phenotype. In future, it is important to look at the effect of sedentary versus active life style and doing or not-doing exercise in this population; and this data needs to be analyzed to see the prevalence of essential hypertension, cardiovascular diseases and comorbids in both the cohorts.

CONCLUSION

A comparative analysis of prevalence of essential hypertension (EHTN) and type-2 diabetes mellitus in the strict-vegetarian as opposed to non-vegetarian cohorts in context to the raised body fat percentage showed a non-significant association indicating some other risk factors to be responsible for producing these diseases in the studied population.

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