

## COMPARISON OF HEART RATE AND BLOOD PRESSURE IN VEGETARIAN AND NONVEGETARIAN SUBJECTS

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**Abstracts:** Background & objectives: Dietary factors play a critical role in the prevention and treatment of various diseases. A vegan diet has favourable effects on multiple risk factors, which would be expected to reduce cardiovascular risk much more than an intervention which influenced only one risk factor. However, the size of the cardiovascular risk reduction is difficult to quantify. Also, it is possible the vegan diet has other effects on health and Cardiovascular risk by mechanisms such as inflammatory pathways which were not assessed in this meta-analysis. Vegans, have a lower prevalence of hypertension and lower systolic and diastolic blood pressures than meat eaters, largely because of differences in body mass index. Sympathetic over activity and enhanced basal vasoconstrictor tone depicted by increased DBP could make non vegetarian individuals more prone to hypertension and other cardiovascular disorders. Earlier epidemiological studies have shown that vegetarian diet leads to blood pressure reduction in both normotensive and hypertensive subjects independent of dietary sodium. Vegetarian life style is associated with less of a rise of blood pressure with age and a decreased prevalence of hypertension. In the present study an attempt was made to find the effect of diet on cardiovascular parameters.

Methods: In the present study the effect of diet on heart rate and blood pressure is compared.

Results: In our study Diastolic Blood Pressure of non-vegetarian subjects is significantly higher than vegetarian subjects. There is no significant difference in Heart Rate and Systolic Blood Pressure between two study groups

**Key Words:** Heart Rate, Systolic Blood Pressure, Diastolic Blood Pressure, Vegetarian subjects, Non-vegetarian subjects.

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**Introduction:** It is well known that a vegetarian or vegan diet, when sensibly managed, can make a contribution to the prevention and therapy of illnesses in all phases of life. <sup>(1)</sup> More and more people are thus adopting a vegetarian or vegan lifestyle. <sup>(2)</sup> According to studies, <sup>(3)</sup> a vegetarian lifestyle can improve the quality of life and it seems to be related to lower incidences of ischemic cardiopathies, obesity, type 2 diabetes, osteoporosis, cerebrovascular accident, Parkinson's disease, hypercholesterolemia and some types of cancer. Although some studies have shown associations between vegetarianism and blood pressure, <sup>(4)</sup> blood lipids, cancer heart disease and all-cause mortality. Apart from the genes and environmental factors, obesity, sedentary lifestyle and dietary habits are the important contributors of increasing prevalence of hypertension even in youngsters. When compared with non-vegetarian diet, studies revealed that vegetarian diet is low in the factors which are positively related to blood pressure.

The vegetarian diet when compared with non-vegetarian diet appears to be low in factors positively related to blood pressure, and high in protective factors, <sup>(5)</sup> this is supported by previous studies showing a high prevalence rate for hypertension in adult non vegetarians in different part of the world. <sup>(6)</sup>

The lower risk of death from ischemic heart disease seen in vegetarians could be explained in part by differences in blood lipid levels. In one large cohort study, which is based on blood lipid levels, the incidence of ischemic heart disease was estimated to be 24% lower in lifelong vegetarians and 57% lower in lifelong vegans compared to meat eaters <sup>(4)</sup>. Typically, studies find lower total cholesterol and low-density lipoprotein (LDL) cholesterol levels in vegetarians. <sup>(7)</sup>

Some intervention studies have demonstrated that when subjects were switched from their usual diet to a vegetarian diet, there is reduction in total and LDL-cholesterol levels. <sup>(8)</sup>

Limited evidences are available that show vegetarian diet is associated with higher high-

density lipoprotein cholesterol levels or with higher or lower triglyceride levels, a vegetarian diet is consistently associated with lower LDL cholesterol levels. The inconsistent results with regard to blood lipid levels could be explained by other factors such as variations in BMI and foods eaten or avoided within the context of a vegetarian diet or lifestyle difference.

Factors in a vegetarian diet that could have a beneficial effect on blood lipid levels include the higher amounts of fibres, nuts, soy, and plant sterols and lower levels of saturated fat. Vegetarians consume between 50% and 100% more fibre than nonvegetarians and vegans have higher intakes than lacto-ovo-vegetarian.<sup>(9)</sup> Soluble fibre has been repeatedly shown to lower total and LDL cholesterol levels and to reduce risk of coronary heart disease.<sup>(10)</sup> A diet high in nuts significantly lowers total and LDL cholesterol levels. Soy isoflavones may play a role in reducing LDL cholesterol levels and in reducing the susceptibility of LDL to oxidation.<sup>(11)</sup>

Plant sterols, found in legumes, nuts and seeds, whole grains, vegetable oils, and other plant-based foods reduce cholesterol absorption and lower LDL cholesterol levels.<sup>(12)</sup> One of the study results suggest that there are no differences in exercise capacity between vegan, lacto-ovo-vegetarians and omnivorous recreational runners.<sup>(13)</sup>

Thus, identifying a relation between dietary habits and risk for future development of hypertension will help in prevention of adult hypertension. The present study was undertaken to observe heart rate and blood pressure in vegetarians and non-vegetarians and to create awareness among the general population.

**Aims and Objectives:** This study aims to assess the anthropometric indices, heart rate and blood pressure values of a vegetarian and non-vegetarian population from Rajkot city, Gujarat state.

**Material and Methods:** About 100 individuals of the age group of 16-50 years participated in the present study. We have selected our healthy volunteers from hospital staff including doctors, nurses, medical assistants and attendants of the patient. History of the subject including age, sex, height and weight were recorded. Subjects were

divided into 2 groups according to their dietary patterns- a) Non-vegetarians b) Vegetarian.

Subjects were classified as nonvegetarians if foods of plant and animal origin, including meat, fowl, eggs, milk and other dairy products, and fish were included in their diet; Vegetarians if foods of plant and dairy products were included in their diet.

Study protocol was approved by Institutional Ethics Committee of PDU Government Medical College, Rajkot.

The study subjects were briefed about the procedure and informed consent was obtained from each participant. A detailed history regarding their dietary habits and history suggestive of any cardio respiratory or any other systemic illness was elicited.

Anthropometry and body composition - Body mass was measured.

After allowing the participants to take rest at the same position for a minimum period of ten minutes, the BP was recorded in sitting position (JNC 7 Criteria) in the right arm using the mercury sphygmomanometer. At least two readings were taken at the interval of 5 minutes and the mean of two was taken as the BP. Blood pressure (BP) was measured in accordance with the standards proposed by the Pan American Health Organization.<sup>(14)</sup>

The data were analysed Z test for two samples and P value <0.05 was considered as significant.

We restricted inclusion to studies of healthy adults who did not have diabetes, hypertension or vascular disease and were not on lipid or glucose lowering medication.

**Observation and results:** In the present study out of the total 100 subjects recruited, a group of 50 were vegetarians and 50 were non-vegetarians. BMI, Heart rate, Systolic Blood Pressure and Diastolic blood pressure are compared between vegetarian and non-vegetarian subjects.

**Table: 1 Correlation between Diet and Heart rate**

Table: 1.1 Heart rate range in Non-vegetarian subjects

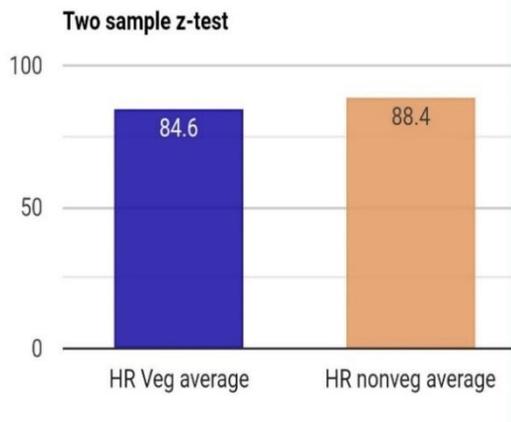
Heart rate range (beats/min)	Number of subjects (Non -Vegetarian)
50-60	1
60-70	3
70-80	8

80-90	18
90-100	12
100-110	4
110-120	2
120-130	2

Table: 1.2 Heart rate range in Vegetarian subjects

Heart rate range (beats/min)	Number of subjects (Vegetarian)
50-60	1
60-70	5
70-80	8
80-90	22
90-100	9
100-110	5
110-120	0
120-130	0

Heart rate (Non-Vegetarian)	Mean: 88.4 SD: 14.37	p Value: 0.1457 Not significant
Heart rate (Vegetarian)	Mean: 84.6 SD: 11.6	



Average of heart rate of vegetarian population is considered to be statistically equivalent to average of heart rate of nonvegetarian population. The difference between average of heart rate of non-vegetarian and vegetarian population is not large enough to be statistically significant. So, in this group diet has no significant effect on heart rate of two population groups

**Table: 2 Correlation between Diet and Systolic blood pressure**

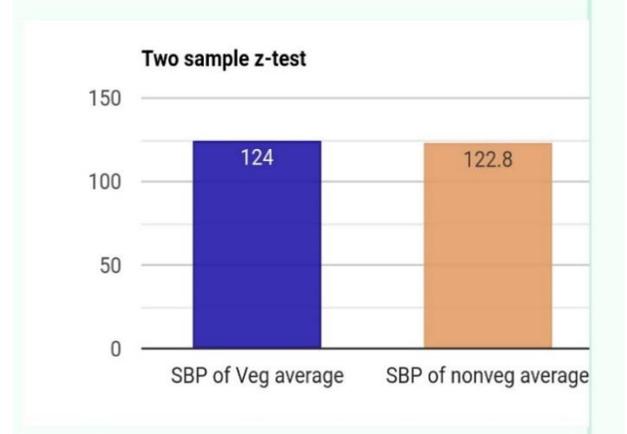
Table: 2.1 Systolic Blood Pressure range in Non-vegetarian subjects

Systolic Blood Pressure range (mmHg)	Number of subjects (Non-Vegetarian)
100-110	6
110-120	21
120-130	8
130-140	8
>140	7

Table: 2.2 Systolic Blood Pressure range in Vegetarian subjects

Systolic Blood Pressure range (mmHg)	Number of subjects (Vegetarian)
90-100	1
100-110	4
110-120	18
120-130	12
130-140	11
>140	4

Systolic Blood Pressure (Non-Vegetarian)	Mean: 122.8 SD: 12.66	p Value: 0.6588 Not significant
Systolic Blood Pressure (Vegetarian)	Mean: 124 SD: 14.46	



Average Systolic Blood Pressure of vegetarian population is considered to be statistically equivalent to average of Systolic Blood Pressure of nonvegetarian population. The difference between average of Systolic Blood Pressure of non-vegetarian and vegetarian population is not large enough to be statistically significant. So, in this group diet has no significant effect on Systolic Blood Pressure of two population groups

**Table: 3 Correlation between Diet and Diastolic Blood Pressure**

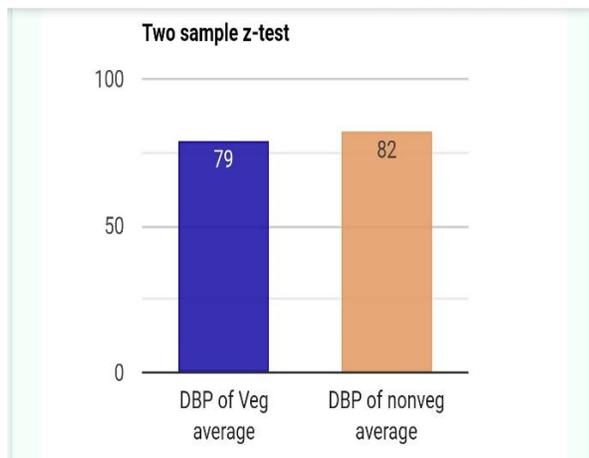
Table: 3.1 Diastolic Blood Pressure range in Non-vegetarian subjects

Diastolic Blood Pressure range (mmHg)	Number of subjects (Non-Vegetarian)
60-70	4
70-80	13
80-90	28
90-100	5

Table: 3.2 Diastolic Blood Pressure range in Vegetarian subjects

Diastolic Blood Pressure range (mmHg)	Number of subjects (Vegetarian)
60-70	5
70-80	21
80-90	21
90-100	3

Diastolic Blood Pressure (Non-Vegetarian)	Mean: 82	p Value: 0.004 Significant
	SD: 7.60	
Diastolic Blood Pressure (Vegetarian)	Mean: 79	
	SD: 7.68	



Average Diastolic Blood Pressure of vegetarian population is considered to be statistically not equivalent to average of Diastolic Blood Pressure of nonvegetarian population. The difference between average of Diastolic Blood Pressure of non-vegetarian and vegetarian population is large

enough to be statistically significant. So, in this group diet has significant effect on Diastolic Blood Pressure of two population groups.

**Discussion:** Vegetarian life style is associated with less of a rise of blood pressure with age and a decreased prevalence of hypertension. (15) At resting conditions, in one of the studies noticed a significant increase in SBP and DBP in non-vegetarians. 7-year blood pressure follow-up study by Miura et al. (16) has revealed that intake of vegetables and fruits were related to less increase in SBP and DBP over time, independent of age. They also observed that those consuming higher intakes of red meat had a significantly greater increase in blood pressure and men with a higher fish and white meat intake had less increase in blood pressure. Similar to the findings of present study were also observed by Varshney et al. (17), but in an age group of young adults. Similar findings were also observed by Nageswari et al. (18), in their study on obese school children. These findings in the form of elevated baseline blood pressure in non-vegetarians is suggestive of derangements in the sympathetic cardiovascular function and borderline response to handgrip dynamometer test in the non-vegetarian children points towards autonomic instability with an increased risk for future development of hypertension.

Observations discovered that in omnivores the change in diastolic blood pressure is higher than in age and sex matched vegetarian and control group. These findings suggest that there may be dysfunction in sympathetic reactivity also, and Alteration in parasympathetic nerve conductivity may cause undue regulatory effects on heart rate. (19)

According to research studies, potassium is a nutrient that can provide vasodilatation; it is present in vegetables and fruits and has an important role in prevention or control of hypertension. Potassium is a widely consumed substance in vegetarian diets. (20)

According to Parente (21), vegetarians usually have normal blood glucose levels and low incidence of type 2 diabetes mellitus due to a diet high in fibre, which has the potential to reduce the glycaemic index. This study reinforces this statement as it did

not identify any diabetic among the vegetarians investigated.

It also became apparent that parasympathetic impairment observed in omnivores. As compared to control during testing, tachycardia was also observed in omnivores. Changes in the cardiac output was compensated by increase in heart rate. The precise mechanism is not clear with this pilot study but it is reasonable to understand that these changes may be due to cardiac dysfunction.

Vegetarian diet with avoidance of risk factors, results in absence of abnormalities in laboratory tests and bone status parameters. <sup>(22)</sup>

#### Conclusion:

We conclude that in our study Diastolic Blood Pressure of non-vegetarian subjects is significantly higher than vegetarian subjects. Non vegetarian diet has significant effect on Diastolic Blood Pressure. There is no significant difference in Heart Rate and Systolic Blood Pressure between two study groups.

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