



# **Comparative Evaluation of Blood Pressure and Heart Rate Variability among Non-vegetarians and Vegetarians**

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## **Authors' contributions**

*This work was carried out in collaboration among all authors. Author SS did the literature search, survey, experimental data collection, analysis, manuscript writing. Author GS did the study design, data verification, manuscript drafting. All authors read and approved the final manuscript.*

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## **ABSTRACT**

**Background:** Dietary approaches to regulate blood pressure should be an important strategy of cardiovascular health. There is extensive study demonstrating multiple individual dietary components and several dietary patterns that affect blood pressure.

**Aim:** The present study planned to investigate the influence of dietary patterns on cardiac functions.

**Materials and Methods:** 20 healthy subjects belonging to regular consumption of vegetarian and heavy non vegetarian diet among the student population were analysed for changes in blood pressure (SBP, DBP, PP, MAP), Pulse rate and heart rate variability (HRV).

**Results:** The results of the study revealed that non vegetarians showed a significant increase in systolic blood pressure ( $p=0.030$ ) ( $p>0.05$ ) and diastolic blood pressure ( $p=0.033$ ) ( $p>0.05$ ) and insignificant decrease in heart rate variability in comparison with the vegetarians.

**Conclusion:** Thus the study concluded that there is a positive interaction of diet preference and changes in blood pressure among vegetarians and non vegetarians.

*Keywords: Diet; blood pressure; heart rate; HRV.*

## 1. INTRODUCTION

Dietary habits make a big difference in both physical and mental aspects of the body. Non vegetarian diet is rich in proteins and fats but that does not make up for all the nutrients required by the body [1]. Consumption of saturated fats increases the risk of hypertension and heart attacks while a vegetarian diet being low in saturated fats keeps blood pressure and cholesterol in control [2]. The hypothesis of the research study is that vegetarians will have a lower blood pressure, leaner bodies and lower resting heart rate compared to nonvegetarians [3]. Heart rate variability is a non-invasive method to assess cardiac autonomic control systems [4,5].

It finds out the relative influence between sympathetic and parasympathetic nerves of the autonomic nervous system [6]. HRV has been considered as a product of emotional response For stress but is becoming apparent that the interval between Which is the marker of the capacity to regulate internal and external demands [7]. Interval are not constant but differ from beat to beat especially higher HRV indicates better gender health. Since the multitude of ways in which the different physiological mechanisms modulate each other in shows that studying or one aspect of the body in isolation limits our understanding[8][9]. Heavy non-vegetarians have reduced heart rate variability which leads to coronary artery disease diabetes, obesity and myocardial infarction. HRV response to various aspects of diet[10][11] And helps detect the diet eliciting negative physiological response[12,13]. Reduced heart rate variability causes sudden cardiac death[14]. Non-vegetarian diet is prone to decrease HRV increase BMI and increases blood pressure[15]. In this view HRV and its association with diet and health are considered. Thus the objective of the study is to evaluate the changes in blood pressure and heart rate variability among heavy non-vegetarians and vegetarians.[16][17] Our team has extensive knowledge and research experience that has translate into high quality publications [18–22][23–27].

## 2. MATERIALS AND METHODS

20 healthy subjects of age group 17-20 years of both genders belonging to regular consumption of vegetarian and heavy non vegetarian diet among the student population of saveetha dental college were taken. They were categorized into two groups.

Group 1 - Vegetarians

Group 2 - Non Vegetarians

After explaining the experimental procedures and making the subjects fully aware of their role in the project, informed consent was obtained from them. Students with known-cardiovascular problems, sleep disorder problems, neurological problems or those who are under medication for some reason or others were excluded from the study. Blood pressure was monitored using a sphygmomanometer and pulse was noted. ECG was taken using electrocardiogram. Heart rate variability was measured in 30:15 ratio by dividing the longest R-R interval near the 30th beat by shortest R-R interval near the 15th beat. The data collected was analysed using paired independent t test using SPSS software version 23.0 with p value less than 0.05.

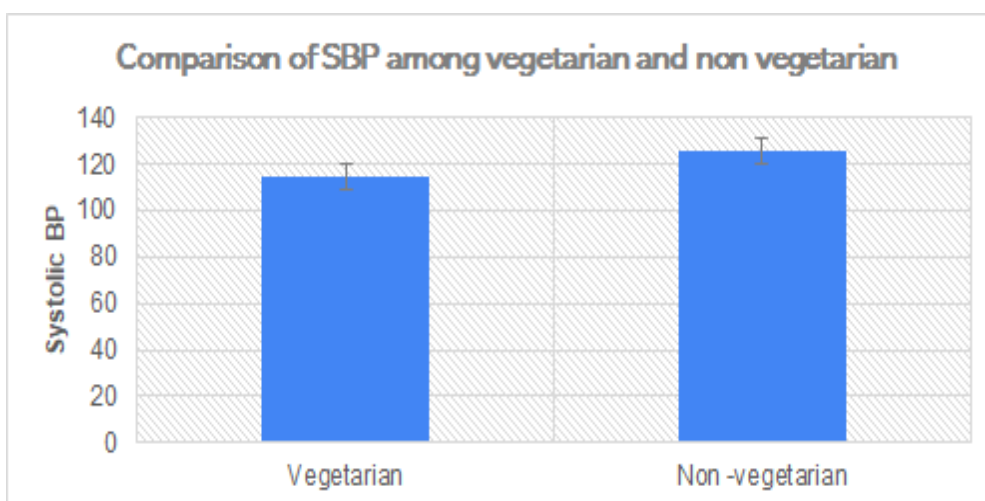
## 3. RESULTS

The comparison of cardiovascular changes in blood pressure and heart rate variability are as follows: There is a significant increase in the systolic blood pressure ( $p= 0.030$ ) among heavy non-vegetarians compared with vegetarians ( $p < 0.05$ ) (Fig. 1). There is a significant increase in the diastolic blood pressure ( $p= 0.033$ ), pulse pressure ( $p=0.039$ ) among heavy non-vegetarians ( $p < 0.05$ ) (Fig. 2, 3). There is no change in the mean arterial pressure ( $p=0.497$ ) ( $p < 0.05$ ) (Fig. 4) and a mild increase (insignificant) in the heart rate ( $p=0.602$ ), heart rate variability ( $p= 0.223$ ) in heavy non-vegetarians (Fig. 5). There is a significant increase in the body mass index ( $p=0.036$ ) among heavy non-vegetarians compared with vegetarians ( $p < 0.05$ ) (Fig. 6).

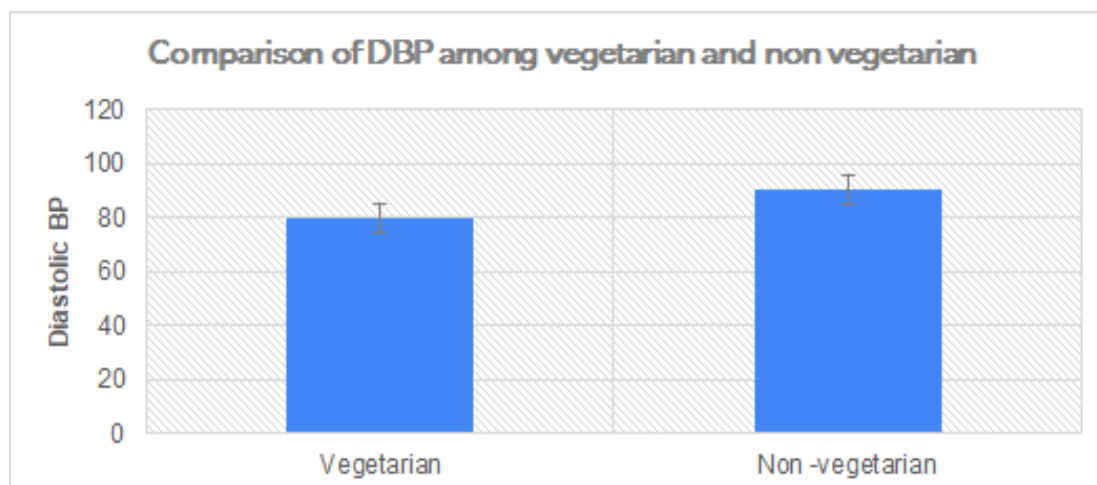
**Table 1. Parameters of body mass index among heavy non vegetarians and vegetarians**

Parameters	Vegetarians	Non Vegetarians
Systolic Blood pressure	114.80 $\pm$ 3.676	125.80 $\pm$ 5.028
Diastolic Blood pressure	79.80 $\pm$ 4.264	90.60 $\pm$ 1.350
Pulse rate	86.90 $\pm$ 6.935	72.00 $\pm$ 5.963
Pulse pressure	32.00 $\pm$ 2.981	36.00 $\pm$ 4.522
Mean arterial pressure	95.62 $\pm$ 6.790	95.25 $\pm$ 8.484
Heart rate variability	1.09 $\pm$ 0.062	1.18 $\pm$ 0.168
Body mass index	17.75 $\pm$ 0.962	22.59 $\pm$ 2.802

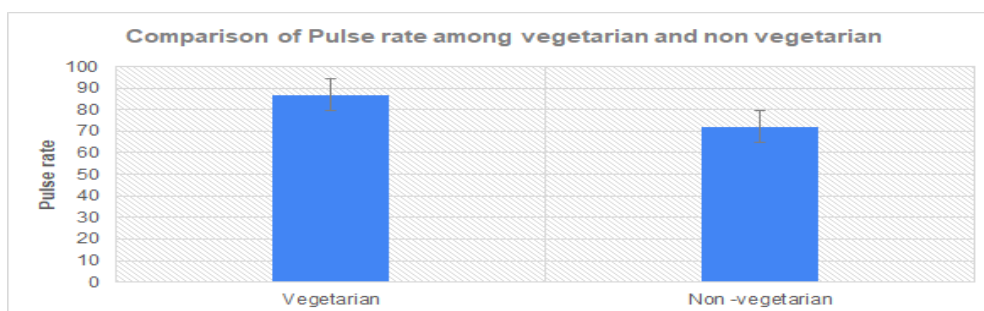
Values are expressed as Mean  $\pm$  stdev



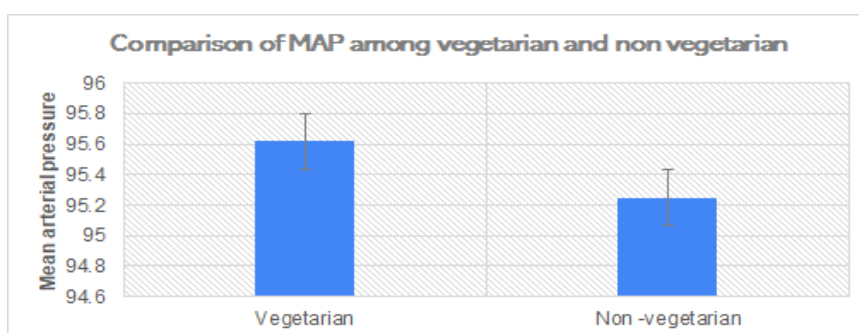
**Fig. 1.** Represents the bar graph of comparison of systolic blood pressure among heavy non vegetarians and vegetarians. X axis represents the type of consumption of food and Y axis represents the systolic blood pressure. There was a statistically significant increase in the systolic blood pressure in heavy non vegetarians when compared to vegetarians( $P < 0.030$ )



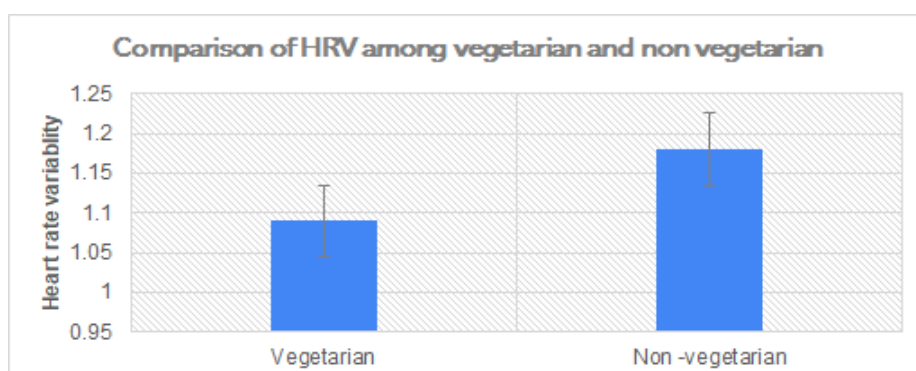
**Fig. 2.** Represents the bar graph of comparison of diastolic blood pressure among heavy non vegetarians and vegetarians. X axis represents the type of food consumers and Y axis represents the diastolic blood pressure. There was a statistically significant increase in the diastolic blood pressure in heavy non vegetarians when compared to vegetarians ( $P = 0.033$ )



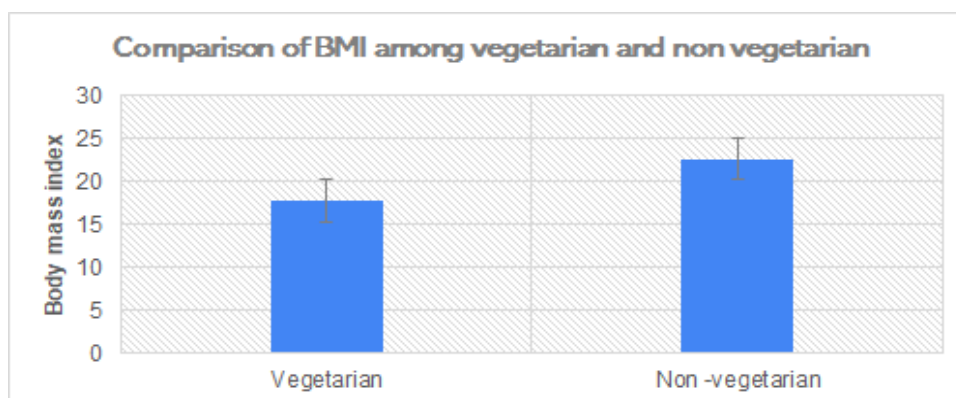
**Fig. 3.** Represents the bar graph of comparison of pulse rate among heavy non vegetarians and vegetarians. X axis represents the type of food consumers and Y axis represents the pulse pressure. There was a statistically significant increase in the pulse pressure in heavy non vegetarians when compared to vegetarians ( $P < 0.039$ )



**Fig. 4.** Represents the bar graph of comparison of mean arterial pressure among heavy non vegetarians and vegetarians. X axis represents the type of food consumers and Y axis represents the mean arterial pressure. There is an increase in the mean arterial pressure among vegetarians when compared with non vegetarians but the value is not statistically significant ( $P=0.497$ )



**Fig 5.** represents the bar graph of comparison of heart rate variability among heavy non vegetarians and vegetarians. X axis represents the type of food consumers and Y axis represents the heart rate variability. There is a mild increase in the heart rate variability among vegetarians when compared to non vegetarians but the value is not significant ( $P=0.223$ )



**Fig. 6.** Represents the bar graph of comparison of body mass index among heavy non vegetarians and vegetarians. X axis represents type of food consumers and Y axis represents the body mass index. There is a statistically significant increase in the body mass index among heavy non vegetarians when compared with vegetarians ( $P=0.036$ )

#### 4. DISCUSSION

In the present study it is found that non vegetarians have increased systolic and diastolic blood pressure and decreased heart rate variability when compared with vegetarians which is similar in accordance with a similar study done by Kiran george, et al in a study sample of 90 undergraduates stating non vegetarian diet decreased the heart rate variability [28].

Various aspects of diet are found to be related to HRV[29]. In general, the kinds of diet and particular foods that are found to be related to a healthy life-style are related to higher HRV. For example, a Mediterranean diet, fish consumption multivitamins and losing weight all increased HRV. However, aspects of diet that are commonly viewed as undesirable, for instance a high fat or trans-fat diet causes reduced HRV [30].

Our study reported that consumption of unsaturated fats over a long period causes increased systolic and diastolic blood pressure and decreased heart rate.[31] Consumption of unsaturated fats increases the prevalence of hypertension. Previous reports suggest that plant-based diets are associated with significantly lowering hypertension[32]. A study reported that black non vegetarians have a higher blood pressure attenuated by the use of anti-hypertensive drugs compared to black vegetarians[33]. An early study examined the postprandial changes in HRV following a 500 kcal test meal (turkey sandwich: 32.4% fat, 17.5% protein and 50.1% carbohydrate).[34]

Heart rate variability decreased during the first and second 30 min following consumption [35,36]. Although there has been limited systematic study, there's a series of reports that relate various indices of HRV to the intake of a variety of food items. As such, there's a good reason to support the further consideration of HRV as a biomarker with the potential to point to the influence of food on health [37,38,37].

It is found that non-vegetarians have decreased heart rate, increased blood pressure which causes many abnormalities in the body like hypertension, coronary artery disease, myocardial infarction et cetera[39]. It is clear that the plant-based diets are associated with significantly lowering the prevalence of hypertension. Thus, this supporting evidence gives positive association between SBP and DBP and diet [40,41]. Thus other factors like dietary composition, resting metabolic rate exercise frequency and thermogenesis may also influence changes in blood pressure.[42] There is no significant change in heart rate variability and this may be attributed to lower sample size. Large prospective longitudinal studies are needed to determine the sensitivity, specificity, and predictive value of HRV [43,44].

#### 5. CONCLUSION

Thus, it can be concluded that there is a positive interaction of diet preference and changes in blood pressure among vegetarians and non-vegetarians. The challenge to create and sustain what's healthy and change what's unhealthy is compelling because improving the nourishment that [12] goes into our bodies can have wide-

ranging benefits in improving the health of societies and environments.

## CONSENT AND ETHICAL APPROVAL

As per international standard or university standard guideline participant consent and ethical approval has been collected and preserved by the authors.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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