



## **Estimation of Blood Pressure on Postprandial Breakfast, Meal and Dinner among Vegetarians**

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### **Authors' contributions**

*This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.*

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### **ABSTRACT**

**Background:** Blood pressure is the pressure of the blood within the arteries. Based on the circadian rhythm the BP can change. DBP can change according to age. Processed foods, canned soups, snack foods, and condiments may increase BP. The main aim of this study is to estimate the difference in postprandial BP responses during breakfast, lunch and dinner.

**Materials and Methods:** A total of 26 healthy volunteers were randomly selected, men and women aged 17-20 for the study. Systolic blood pressure, Diastolic blood pressure, Heart rate were measured with ambulatory Blood Pressure devices every 10 min before until 90 min after each meal. The measurements were taken to identify the difference in postprandial Blood pressure responses between breakfast, lunch and dinner. Before starting the study, informed consent was taken. Data were collected and analyzed using SPSS software, independent sample T test.

**Results:** In the present study, there was a mild increase observed before and after breakfast, lunch and dinner. There is a difference in BP before and postprandial during breakfast, lunch and dinner. In the present study, there was a mild increase observed before and after breakfast, lunch and dinner. In the morning the body releases hormones such as adrenaline and noradrenaline. These hormones boost energy which raises the BP. So there is decrease in BP before and postprandial during breakfast

**Conclusion:** From this study only a significant difference was observed in SBP, DBP, HR of dinner. There was no significant change seen in breakfast.

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**Keywords:** Blood pressure; dietary patterns; healthy diet; hypertension; DASH diet; innovative technology.

## 1. INTRODUCTION

Blood Pressure is the pressure of blood against blood vessels. Two blood pressure: Systolic blood pressure (SBP) and Diastolic blood pressure (DBP). Optimal systolic blood pressure is 120 mmHg and optimal diastolic blood pressure is 80 mmHg. SBP measures the pressure that blood exerts on vessels while the heart is beating. DBP measures the pressure in the vessels between heartbeats. Normal blood pressure level is less than 120/80 mmHg [1]. Normally the blood pressure is lower at night while sleeping. But, a few hours before I wake up, my blood pressure starts to rise. Usually, BP will be peaking in the middle of the afternoon and in the evening BP drops again [2].

People with high blood pressure will not experience any symptoms and hypertension also known as silent killer [3]. When blood pressure reaches nearly 180/120 mmHg it is a hypertensive crisis. Getting less oxygen will damage blood walls and make it harder to regulate the blood pressure [4]. Decreased secretion of thyroid hormones can slow the heart rate [5].

High blood pressure is associated with high cardiovascular risk. In elder people, the most powerful predictor of risk is due to the increase in pulse pressure which causes decreased diastolic and increased systolic pressure. An increase in BP is an inevitable consequence of ageing [6]. Temporary decrease in blood pressure can compensate by constricting the blood vessels present in the digestive tract (outside) which causes the heart to beat faster [7,8].

Water drinking increases systolic blood pressure by 100 mmHg in some renal or hepatic patients. In such patients water should be avoided for 1.5 hours after retrieving. Citrus fruits such as grapefruit may have powerful effects of lowering the blood pressure [9]. When a person had food, the body directs blood to the digestive tract to help digestion. If someone has high blood pressure, a DASH diet or Mediterranean diet can lower BP. Blood pressure can be raised by excessive intake of salt and mood swing or anger.

Diet is an important factor, which can prevent hypertension. Vegetarian diet can lower the

blood pressure. Vegetarian dietary patterns significantly reduce systolic and diastolic blood pressure. Vegetarians consume foods like vegetables, grains, legumes, fruits and dairy products. Some people rarely include eggs. Vegetarian people consume less protein foods. As a vegetarian you cannot have meat, fish which are rich in protein content compared to vegetables and grains [10].

Our team has extensive knowledge and research experience that has translate into high quality publications [11–13,4,14–24,8,25–28].

The main aim of the study is to estimate the difference in postprandial BP responses during breakfast, lunch and dinner.

## 2. MATERIALS AND METHODS

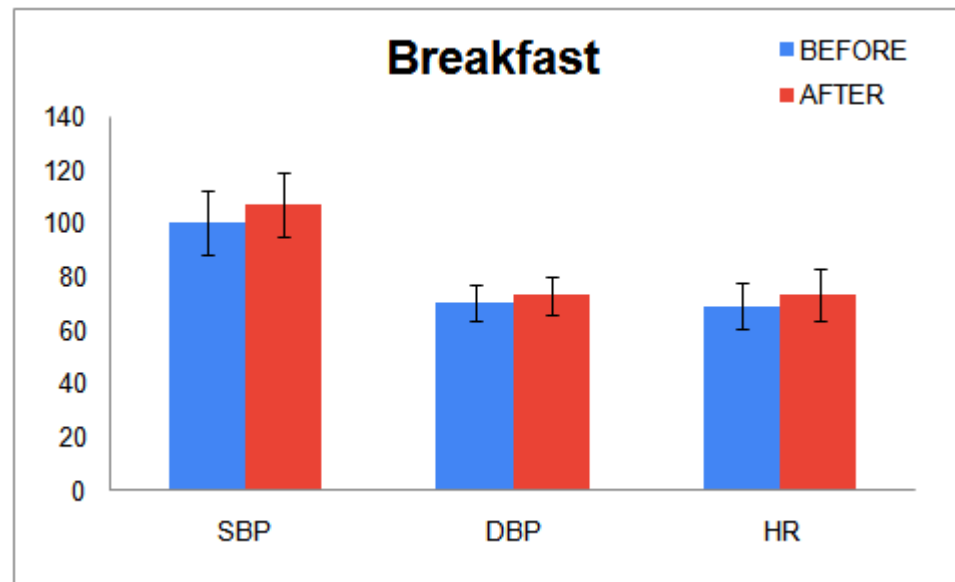
A total of 26 healthy volunteers were randomly selected, men and women aged 17-20 for the study. Systolic blood pressure, Diastolic blood pressure, Heart rate were measured with ambulatory Blood Pressure devices every 10 min before until 90 min after each meal. The measurements were taken to identify the difference in postprandial Blood pressure responses between breakfast, lunch and dinner. All the participants gave their written informed consent before beginning the trial. Data were collected and analyzed using an independent sample T test.

## 3. RESULTS

In the present study, there was a mild increase of BP and heart rate observed before and after breakfast, lunch and dinner (Table 1). There is a difference in BP before and postprandial during breakfast, lunch and dinner. There was a statistically significant difference found before and after dinner of all parameters. There was a statistically significant difference found before and after meals of DBP and HR. There was a statistically insignificant difference found before and after breakfast (Table 2). In the present study, there was a mild increase observed before and after breakfast, lunch and dinner (Fig. 1, 2, 3). In the morning the body releases hormones such as adrenaline and noradrenaline. These hormones boost energy which raises the BP. So there is decrease in BP before and postprandial during breakfast.

**Table 1. Mean and SD of before and after breakfast, lunch and dinner**

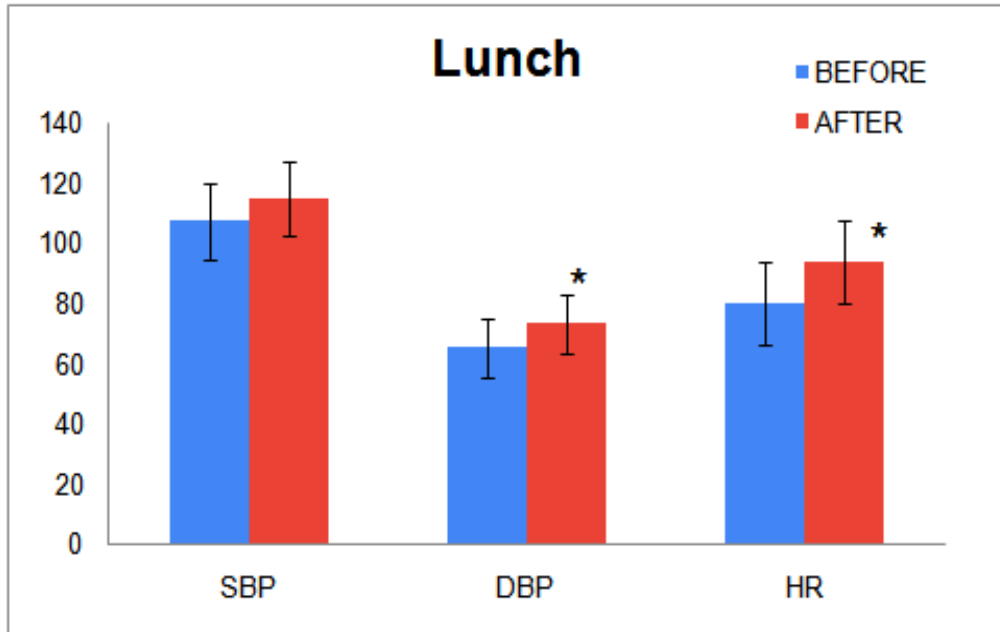
	Breakfast		Lunch		Dinner	
	Before	After	Before	After	Before	After
SBP	100.23 ± 11.98	106.84 ± 12.08	107.21 ± 12.78	114.73 ± 12.53	98.52 ± 6.80	113.05 ± 15.11
DBP	70.25 ± 6.51	73.15 ± 7.01	65.36 ± 9.77	73.15 ± 9.61	66.21 ± 7.80	76.20 ± 8.97
HR	69.25 ± 8.54	73.26 ± 9.64	79.89 ± 13.59	93.47 ± 13.77	79.42 ± 13.99	94.42 ± 15.61



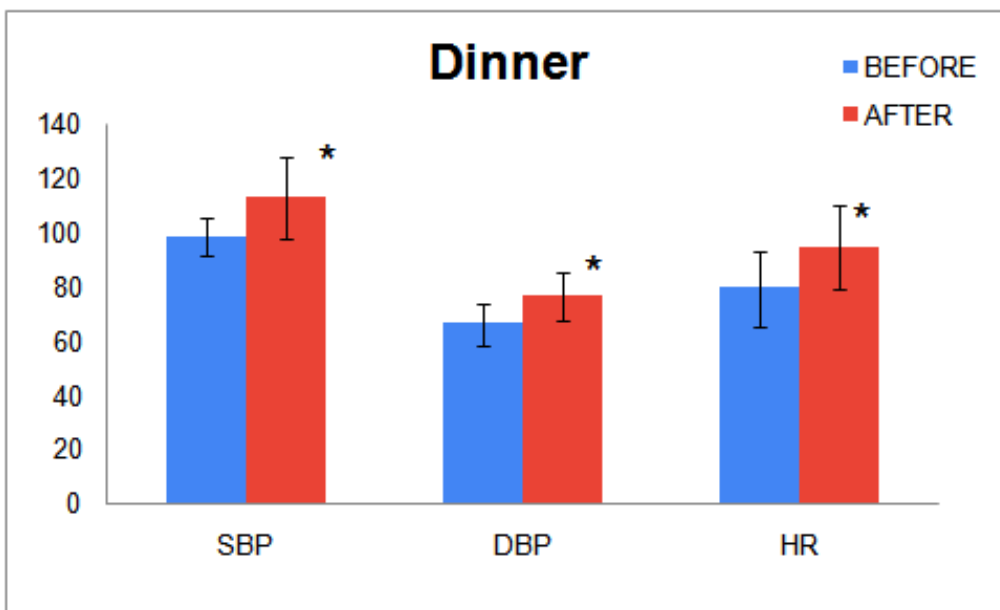
**Fig. 1. The bar graph represents the breakfast before and after. Blue represents the before and red represents after breakfast. There was no significant difference found in SBP, DBP, HR after breakfast**

**Table 2. Significance level of independent sample t test**

Parameters	Breakfast	Lunch	Dinner
SBP	0.09	0.07	0.00
DBP	0.392	0.008	0.00
HR	0.183	0.004	0.00



**Fig. 2. The bar graph represents the lunch before and after. Blue represents the before meal and red represents after meal.\* represent statistically significant (p<0.05). There was a significant difference found in DBP, HR after meals**



**Fig. 3. The graph represents the before and after dinner. Blue colour represents the before dinner and red colour represents after dinner. \* represent statistically significant (p<0.05). There was a significant difference found in SBP, DBP, HR after dinner**

#### 4. DISCUSSION

The main finding of this study is the relevant variation of before and postprandial BP response during the day among young adolescents. There is no significance in SBP, DBP, HR in breakfast and DBP, HR is significant in lunch, SBP, DBP, HR is significant in dinner.

Previous studies conducted among vegetarian meals and people consumed a comparable meal at both breakfast and lunch, dinner and had a standardized period of fasting before both the lunchtime and dinner time tests [29]. There are some differences in before and postprandial BP in breakfast, lunch and dinner [30]. But there is no significant difference found in SBP, DBP, HR of the breakfast and no significant difference in SBP of lunch and there is significant difference in DBP, HR of the lunch and also there is significant difference in SBP, DBP, HR of the dinner [31,32]. However, results suggest that central hemodynamic measures are more sensitive to the feeding state than are standard BP measurements.

Many studies are done in postprandial time and at different meal times. This is the first study put forward to study the SBP, DBP, HR of breakfast, lunch and dinner [33,34]. Clinical BP measurements for the diagnosis and monitoring of hypertension should be performed in a standardized manner with respect to meals [35]. This Random BP measurement may be appropriate for primary care, but the operator should be aware of the fasting and inform the patient the meaning of the result recorded. There is a controversial study to the present study that BP has increased from breakfast to lunch.

The limitations of this study were done on a limited population in a shorter duration. The study cannot compare vegetarian and non-vegetarian individuals. It also cannot check the carbohydrate, fats and protein intake.

#### 5. CONCLUSION

From this study, only a significant difference was observed in SBP, DBP, HR of dinner. There was no significant change seen in breakfast.

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- Saveetha Institute of Medical and Technical Sciences
- Saveetha Dental College and Hospital
- Saveetha University
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#### CONSENT AND ETHICAL APPROVAL

The study was approved by the institutional ethics committee and was conducted in accordance with the guidelines. Before starting the study, informed consent was taken.

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#### COMPETING INTERESTS

Authors have declared that no competing interests exist.

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