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DIETARY PATTERNS ON THE RESTING CARDIOVASCULAR PARAMETERS AND THEIR REACTIVITY TO LABORATORY MENTAL STRESS.

Community Medicine

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ABSTRACT

BACKGROUND: From time, immemorial dietary modifications have been used to get better the overall health, combat diseases, and/or prevent their occurrence. Inclusion of meat especially in large amounts has been hypothesized to lead to various ill effects, while adopting variants of vegetarian diet is said to afford healthy benefits. **AIMS AND OBJECTIVES:** This study aims to delineate the role of dietary patterns on the resting cardiovascular parameters and their reactivity to laboratory mental stress. **MATERIALS AND METHODS:** fourty-five subjects meeting the inclusion criteria were recruited and divided based on their dietary preferences into vegetarians (V) and non-vegetarians (NV). They underwent heart rate (HR) and blood pressure (BP) measurements under basal as well as during the mental stress protocol (serial subtraction task). These parameters were compared between the two groups using unpaired t-test, with significance being considered when $P < 0.05$. **RESULTS:** The resting values of HR (bpm) (V-86.69 ± 8.97, NV-73.84 ± 11.61), systolic BP (SBP) (mm of Hg) (V-102.06 ± 9.33, NV-101.42 ± 7.84), and diastolic BPs (DBPs) (mm of Hg) (V-72.13 ± 7.84, NV-71.31 ± 6.10) were similar in both the groups, and their response to mental stress was also alike. **CONCLUSION:** The resting values of HR and BPs (SBP and DBP) were similar in both the groups, and the amplitude of rise in these parameters on application of mental stress test protocol was not affected by the type of diet being consumed.

KEYWORDS

Blood Pressure; Heart Rate; Mental Stress; Serial Subtraction; Vegetarian

INTRODUCTION

A healthy diet can be defined as a pattern of food intake that has beneficial effects on health or at least produces no harmful effects.[1] A vegetarian diet is described as one which excludes animal products to variable extents. Depending on the animal products that are excluded, we have a range of vegetarian diets – Vegan (or total vegetarian), raw food vegan, lacto-vegetarian, ovo-vegetarian, lacto-ovo vegetarian, Mediterranean, whole-foods-plant-based-low-fat, etc.[2]

Vegetarian (V) diet has been cited to confer on its consumers positive effects on several parameters such as blood cholesterol, blood pressure (BP), fasting blood sugar, blood insulin, and C-reactive protein. It is also said to provide benefits on cardiovascular health and protection from some types of cancers. Some of these effects could be indirectly attributed to the occurrence of different microbial flora seen in their gut.[3] An assessment of the available evidence regarding the protective effects of a diet rich in fruit and vegetables by the World Health Organization and the Food and Agriculture Organization suggests that the risk reduction for cancer was probable/ possible, it was convincing for cardiovascular disease (CVD) reduction, and probable for reduction in risk for developing osteoporosis.[4]

People consuming a non-vegetarian (NV) diet have been shown to exhibit a higher mean BMI (body mass index) compared to their vegetarian counterparts, and in them, it demonstrates a linear relationship with the extent of consumption of meat and dairy products. The prevalence of obesity in NVs was 33.3% compared to a value of 9.4% in V.[5]

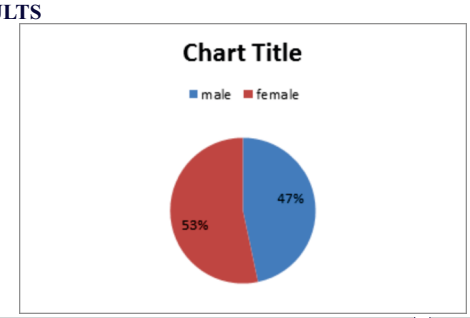
Laboratory mental stress like physical anxiety can be adopted as a technique to unravel the susceptibilities in the cardiovascular system to various disorders. They come in a variety of ways such as public speaking, color-word conflict, and mental arithmetic task. They in fact fare better than exercise test in their ability to predict the chances of subsequent cardiac death in patients suffering from coronary artery disease.[6] Increased cardiovascular responses systolic BP (SBP) to mental stress tasks have been shown to be capable of predicting future SBP levels.[7] In fact, systematic analysis of studies that used mental stressors has shown that an increased cardiovascular responsivity to mental stress or taking longer duration to recover from it is capable of predicting a poor cardiovascular status in the future or even risk of CVD.[8]

Dietary modifications have been used as preventive measures or even to ameliorate CVDs. In this context, vegetarian diets have been shown to diminish the perceived stress levels.[9] Whereas research findings are available (though contradictory) regarding cardiovascular parameters (heart rate [HR], SBP, and diastolic BP [DBP]) under basal/resting conditions, there is a dearth of studies assessing the effect of mental stress on these cardiovascular parameters in relation to dietary preferences. The present study was an attempt to see whether a vegetarian diet over a NV diet affords any advantages in terms of resting cardiovascular parameters and also their reactivity to laboratory mental stress in normal subjects.

MATERIALS AND METHODS

This study was done in the clinical laboratory of the department of physiology, after obtaining the requisite clearance from the Institutional Ethics Committee. The study sample consisted of subjects meeting the prescribed inclusion criteria, that is, apparently healthy individuals in the age group of 18–25 years. The reasons for exclusion from the purview of this study included factors such as being hypertensive/ diabetic, having a family history of hypertension/ diabetes, consumption of alcoholic beverages/tobacco, and on prescription drugs affecting the cardiovascular system. Thirty-five subjects who met these criteria formed the study sample (all were females), and based on their self-professed diet pattern, they were classified as V (*n*-21) and non-V (*n*-24). All the subjects provided their informed consent before taking part in this study. The study itinerary consisted of collecting the anthropometric data using standardized methodologies, followed by recording the resting supine electrocardiogram (ECG), and BP measurements (SBP and diastolic BP). Lead 2 ECG was used to calculate the HR. After this, the subjects were instructed to perform the serial subtraction task (subtracting the number 7 from 1523 serially) and vocalize the results. After a period of 30 s of start of this task, the ECG and BP measurements were repeated. Unpaired *t*-test was used to compare these cardiovascular parameters (under basal as well as during stress conditions) between the vegetarian and NV subjects, and $P < 0.05$ was considered as statistically significant. Statistical analysis was performed using GraphPad online resources.

RESULTS



The participants in this study were similar from an anthropometric point of view (weight = 45.83 kg in V and 45.20 kg in NVs, *P*-value – 0.77), despite their differences in the type of diet that they consume (V vs. NV). The HR, SBP, and DBPs under basal conditions as well as the values recorded during the acute mental stress (AMS) test (i.e., serial subtraction task) procedure were similar (statistically not significant) between the two study groups [Table 1].

As expected on administration of AMS, there was a rise in the values of cardiovascular parameters of interest (HR, SBP, and DBP), but the quantum of reactivity produced in these cardiovascular parameters in V and NVs was also similar [Figure 1].

DISCUSSION

In our study, the resting cardiovascular parameters (HR, SBP, and DBP) were alike in V and NVs. The amplitude of reactivity of these parameters in response to mental stress was also similar in people adopting these two dietary patterns.

Parameters	Heart rate (bpm) (mean±SD)		SBP (mm of Hg) (mean±SD)		DBP (mm of Hg) (mean±SD)	
	Basal	AMS	Basal	AMS	Basal	AMS
Vegetarian diet (*n*-16)	95.69±8.96	97.94±10.10	102.06±9.32	107.31±9.05	71.13±7.74	73.69±6.69
Non-vegetarian diet (*n*-19)	84.84±10.61	95.47±11.58	103.42±7.81	108.11±9.98	72.21±6.20	74.32±7.89
t-value	0.5487*	0.3956*	0.1249*	0.0638*	0.4611*	0.5477*

*P>0.05 – not significant. AMS: Acute mental stress

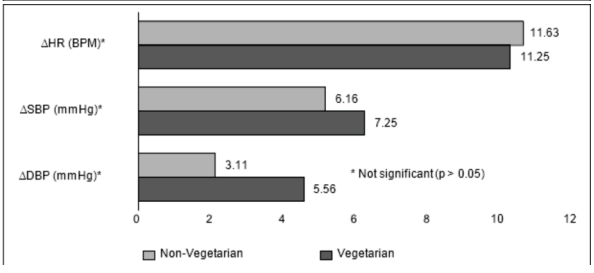


Figure 1: Reactivity of cardiovascular parameters to mental stress

The effect of consumption of meat on the cardiovascular system especially on BP is variable as reported by several studies, with some showing a negative impact on BP due to consumption of red meat, others not showing such effects to white meat consumption and some others which did not discover any negative association between meat consumption and BP.[10] There are several possibilities for these apparently conflicting results. Although the Maasai population residing at the Ngorongoro Conservation Area consume red meat and very little vegetables or fruits, there was no clinically relevant association between red meat consumption and hypertension, and this has been attributed to factors like higher levels of physical activity in them and non-inclusion of salt in meat preparations.[11] Another reason ascribed is the relative intake of sodium, potassium, and energy, with a higher intake of sodium and energy combined with a lower intake of potassium being associated with higher SBP.[12] Hypertension is also associated with consumption of processed rather than unprocessed meat, as the process of processing the meat increases the sodium and nitrite amounts in them.[13] On the other hand, many studies have shown that consumers of a vegetarian diet have the propensity to exhibit lesser BP (systolic as well as diastolic) and also a lesser prevalence of hypertension. However, these benefits are linked to the fact that these subjects had a significantly lower BMI.[14,15] In our study, the subjects consuming a vegetarian diet as well as those taking a NV diet had a similar weight profile.

The main limitations of the present study are a smaller sample size and also the lack of quantification of the amount and nature of meat products that were being consumed by the participants.

CONCLUSION

The resting cardiovascular parameters (HR, SBP, and DBP) and their alteration in response to mental stress were similar in those professing a vegetarian as well as those consuming a NV diet. This is likely due to the fact that the even though the study groups practice different dietary patterns, their weight profile was similar.

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