

Effect of Intake of Blueberries in Hypertensive Patients

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Abstract: ***Aim:** To study the effect of blueberry in control of blood pressure in hypertensive patients. **Objective:** To find out whether blood pressure increases or decreases on the consumption of blueberries in 30 hypertensive patients for 2 weeks. **Background:** Blueberry consumption has been shown to have various health benefits in humans. However, the effect of blueberries on blood pressure is not very much known. Other fruits and plant extracts have not produced the same result. They contain micronutrients with moderate levels. Blueberries contain anthocyanins, other poly phenols and various photochemicals under preliminary research for their potential role in the human body. They are available as fresh or frozen fruit, purée, juice or dried fruits used for making jellies and jams. **Reason:** This study was conducted to investigate the role of blueberry consumption in modifying of blood pressure in hypertensive patients.*

Keywords: Blueberries; blood pressure; hypertensive; anthocyanins

1. Introduction

One of the major leading cause of death all over the world today is the cardiovascular disease (CVD)[1]. Insulin resistance, central obesity, dyslipidemia and hypertension are some of the risk factors for (CVD)[2]. These risk factors lead to vascular abnormalities like endothelial dysfunction, which is the very early step in the process of atherosclerosis and is also related to increased adverse CVD outcome[3]. Endothelial dysfunction can be improved and some studies show that the risk of developing endothelial dysfunction increases with the number of risk factors present in an individual[4,5]. Blood pressure is the force exerted by the blood against the walls of blood vessels, and the magnitude of this force depends on the cardiac output and the resistance of the blood vessels. As per the WHO guidelines, the normal blood pressure is below 120 systolic and below 80 diastolic and higher than that is considered as hypertensive.

Hypertension is defined as having a blood pressure higher than 140 over 90 mmHg, with a consensus across medical guidelines. The number of people living with hypertension (high blood pressure) is predicted to be 1.56 billion worldwide by the year 2025. Around the globe, about 75 million people have hypertension, with more people dying of hypertension-related cardiovascular disease than from the next three deadliest diseases combined. In 2011-2012, about a third of all people over the age of 20 years had hypertension, based on high blood pressure assessments and the number of people taking antihypertensive medications. So control of hypertension has become a key national priority in most of the countries. The increasing prevalence of the condition is blamed on lifestyle and dietary factors, such as physical inactivity, alcohol and tobacco use, and a diet high in sodium (usually from processed and fatty foods). Lifestyle measures are standard first-line treatment for hypertension, although doctors will prescribe medication alongside lifestyle measures to lower blood pressure in people with a level above 140 over 90. Drugs are usually started as monotherapy (just one drug) and at a low dose. Side-effects associated with antihypertensive drugs are usually minor but lifelong. So most of the people are

worried about the side effects of these drugs and wont undergo medication which makes it even more worse. It is always better to control hypertension in a natural way. Consumption of fruits such as berries has been correlated with decreased risks of cardiovascular disease (CVD) and ultimately hypertension too. National Health Objectives reflected in healthy people in 2010 advocate increasing fruit consumption by more than 75% or to at least 2 servings per day in 2 years of age and older persons [6]. The consumption of berry fruits and their contribution to improving cardiovascular health is a subject of interest. The commonly consumed berries are blackberry, black raspberry, blueberry, cranberry, red raspberry, and strawberry. Blueberries are low in calories and rich in moisture and fibre. They contain natural antioxidants such as vitamins C and E and micronutrients such as folic acid, calcium, and lutein phytochemicals found in berries that include polyphenols along with high proportions of flavonoids including anthocyanins which comprises the largest group of natural, water soluble, plant pigments and radiate the bright colours to berry fruits[7-10]. They are present in concentrated conditions in the skin of berry fruits. Certain studies show that berry anthocyanins are poorly bioavailable and are extensively conjugated in the intestines and liver, and are excreted in urine within 2-8 hours post consumption[11 & 12]. Post harvest processing, such as pressing, pasteurisation and conventional and vacuum drying can specifically affect the polyphenols(including anthocyanins) and vitamin content of berries[13-15]. In a comprehensive analysis of the antioxidant potential of commonly consumed polyphenol- rich beverages in the United States, blueberry juice was ranked among the top 4 contributors of dietary antioxidants after pomegranate juice, red wine, and concord grape juice [16]. Several mechanistic studies provide evidence of antioxidative (17,18), antiinflammatory (19,20), antihypertensive (21,22), antidiabetic (23,24), antiobesity (25), and antihyperlipidemic (26,27) effects of blueberries, providing possible rationale for cardio-protective mechanisms. Based on these mechanistic studies, consuming blueberries might favorably alter individual components of metabolic syndrome, a rapidly escalating public health problem (28). Metabolic

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syndrome has been characterized by abdominal adiposity, dyslipidemia (high triglycerides, low HDL cholesterol), hypertension, impaired glucose tolerance, elevated oxidative stress, inflammation, and increased risks for type 2 diabetes and atherosclerotic cardio-vascular disease (CVD).

2. Materials and Methods

Subjects

50 Participants in the study were recruited within Chennai, India. All participants gave written informed consent before participating in the study. The inclusion criteria included participants who were older than 30 years i.e., between 30-60 years of age. Participants had to exhibit elevated blood pressure (no antihypertensive medication, 140-179 mmHg systolic or 90-109 mmHg diastolic). Subjects with known diseases, such as diabetes, liver, kidney or heart disease, were excluded. Furthermore, subjects that smoked were excluded from the study. The majority of our participants were hypertensive but were hesitant to take medicines as they were worried about its side effects and were trying to control their blood pressure by yoga, balanced diet and exercise. Furthermore, participants abstained from using nonprescription drugs, vitamins, dietary supplements and herbal supplements four weeks prior to the start of the study and throughout the duration of the study.

Study Design

Recruitment began in October 2015 when the final participant was finished. Participants who met the inclusion criteria were first asked to monitor their blood pressure for four weeks (every morning and night) and report the readings to the clinic. For the next four weeks, they were asked to consume 100g of blueberry before lunch and required to monitor their blood pressure every morning and at night and report that to the clinic. So all together this study took place for 2 months.

The participants consumed 100g of blueberries either as fresh fruits or as a smoothie. The participants were instructed to consume the blueberries during lunch time with at least 6 hours apart from the breakfast time. Based on their eating patterns and usual intake, the participants were counselled on the importance of maintaining their body weight by eliminating approximately 500 kcal/day from their daily intake to compensate for the energy consumed in the blueberries. The participants were cautioned about gaining weight during the study, and their weight was monitored weekly to verify that there was no weight gain.

Blood-Pressure Measurement

The participants were asked to abstain from the intake of their antihypertensive medication during the duration of the study. The signal was recorded after inflating a blood pressure cuff on one arm, which temporarily arrested the blood flow to the fingers. The computer software provided by the manufacturer was used to compare the arterial pressure ratio in the two fingers before and after occlusion. A 24-hour ambulatory blood pressure was monitored over thirty days using an automatic blood pressure monitoring

device pre- and post-intervention. The blood pressure measurements were taken in the mornings followed by 60 minute intervals during the night [29], and there were no restrictions on their food and beverage consumption before the measurements were taken.

Body Weight

Body weight, body composition and insulin sensitivity were all measured after a 10-hour fast (no eating, drinking, or caffeine use). Furthermore, the participants were asked to abstain from the intake of their antihypertensive medication every day during the duration of the study. Body weight was measured once a week on a digital balance accurate to 0.1 kg with participants wearing a robe without shoes at each visit.

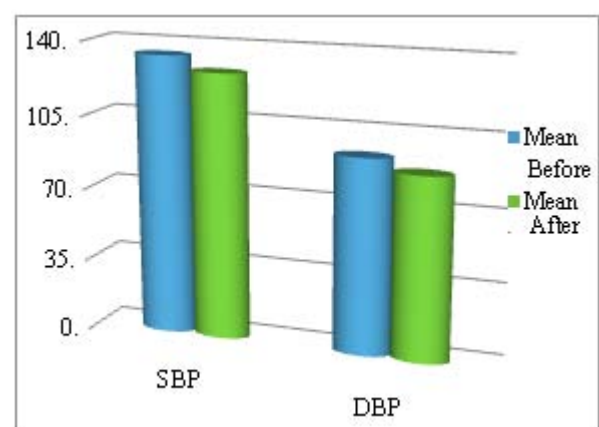
Statistical Analysis

The blood pressure reading of each patient was gathered at the end of 4 weeks. The systolic reading and diastolic reading (morning and night) was separated and the average was taken.

3. Result

	Before		After		P Value
	Mean	Standard Deviation	Mean	Standard Deviation	
Systolic Blood Pressure Reading	134.68	2.15	127.56	1.83	0.000 (significant)
Diastolic Blood Pressure Reading	93.58	2.34	87.66	1.61	0.000 (significant)

*** P < 0.001



Using paired T Test, we found that there is statistical significant difference between before and after in Systolic Blood Pressure Reading and Diastolic Blood Pressure Reading at P<0.001.

4. Discussion

Blueberries make high blood pressure take a nosedive. Eating blueberries daily for just 4 weeks can drop your blood pressure by 4% to 6%. Even more impressive, it works on obese adults with metabolic syndrome, a scary group of risk factors that invites heart disease and diabetes.

In a recent study of people with health conditions, those who had freeze-dried blueberries added to their diets every day experienced significant improvements in both their systolic and diastolic blood pressure after just eight weeks.

Researchers think that nutrients in blueberries may help soften blood pressure by increasing body levels of enzymes that relax blood vessels. These enzymes also support healthy endothelium -- those fragile cells that line blood vessel walls. And the blueberry loving' may be particularly helpful for people with sub-par health. In the study, all of the men and women were obese (body mass index of 30 or more) and had metabolic syndrome -- a cluster of health risk factors that can lead to diabetes or heart disease.

The amount of blueberries the people in the study consumed was pretty high -- the equivalent of over two cups of fresh berries per day. But blueberries aren't the only way to get some blood-pressure-friendly berry nutrition into your diet. Similar benefits have also been seen in studies with cranberries, strawberries, raspberries and lingonberries as well as other fresh fruit.

The study, in *The Journal of the Academy of Nutrition and Dietetics*, found that those who ate the blueberry preparation saw an average 5.1 percent decrease in systolic blood pressure (the top number) and a 6.3 percent decrease in diastolic pressure. Levels of nitric oxide, known to be involved in relaxing and widening blood vessels, increased significantly in the blueberry eaters. There were no significant changes in the placebo group.

The improvement, the scientists write, was moderate compared with that of blood pressure medicines. But, they say, eating blueberries in larger amounts or for longer periods could increase the effect.

The lead author, Sarah A. Johnson, a postdoctoral researcher at Florida State University, said she saw no reason for people to radically change their diet, but that if they are not eating blueberries, they might want to try them. "There is something very special about the composition of blueberries that is responsible for their effect on blood pressure," she said. "Other fruits and plant extracts have not produced the same result." [30]

5. Conclusion

The effect of blueberries was very much observed in this study. It was effective in keeping the blood pressure under control.

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