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Original research paper

## EFFECT OF SUPPLEMENTATION OF TENDER COCONUT WATER ON BLOOD PRESSURE OF PRIMARY HYPERTENSIVE SUBJECTS

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### ABSTRACT

**Background:** Hypertension is a major health problem worldwide. Increased vascular resistance, sodium retention & sympathetic over activity contributes to the blood pressure elevation. Plant foods may be beneficial in decreasing blood pressure (BP). Recently much attention has been focused on plant foods that may be beneficial in preventing Hypertension, metabolic syndrome and possibly reduce the risk of various diseases. This clinical study was conducted to test the effectiveness of a structured intervention on BP of primary hypertensive subjects. **Aim:** To study the effect of Tender Coconut Water (TCW) on BP of Primary hypertensive subjects. **Methods and Material:** 70 subjects were selected randomly sample for 6 weeks of the intervention program. Among them 40 subjects were selected as the experimental group and 30 300ml/day for 6 weeks whereas the control group was instructed to follow the same routine without modifications. One initial, two mid intervention (after every 15 days) and one final (post intervention) BP recorded for both the groups. The obtained data was statistically analyzed. **Results:** The mean systolic BP of experimental group and control group were decreased from 145.8 mm Hg and 141mm of Hg to 135.3 mm of Hg and 140 mm of Hg respectively. The mean diastolic BP of experimental group and control group were decreased from 93.7 mm Hg and 90.9 mmHg to 86.9 mm of Hg and 89.7 mm of Hg respectively. **Conclusion:** Irrespective of cause of hypertension TCW has beneficial effect on BP. TCW contains high amount of potassium which causes vasodilatation and also improve the endothelial function.

**Keywords:** Hypertension, Systolic, diastolic blood pressure, Potassium, Tender Coconut water

### INTRODUCTION

In India subsequent studies showed a steadily increasing trend in hypertension prevalence and it is emerging as the biggest public health problem

today<sup>1</sup>. They are the principle cause of death in all developed countries accounting for 50 percent of all deaths and are also emerging as a prominent

public health problem in developing countries, ranking third with nearly 16 percent of all deaths. Many developing countries are now in a phase of epidemiological transition and face the double burden of communicable and non-communicable diseases, with the severe repercussions this has on their very weak economies<sup>2</sup>. Both systolic and diastolic BP has a continuous, graded, strong, independent and an etiologically significant relationship to the outcome variables such as cardiovascular mortality and all-cause mortality<sup>2,3</sup>. The DASH (Dietary Approach to Stop Hypertension) diet advocates increased usage of fruits, vegetables and low-fat dairy products and includes whole grains, nuts, poultry and fish. It has low quantities of fats, red meat, sweets and sugar-containing beverages. It is thus rich in potassium, magnesium, calcium and fiber and has low amounts of total fat, saturated fat and cholesterol<sup>4,5,6</sup>.

As the dietary management of hypertension can prevent cardiovascular, renal and many other diseases this study was conducted to observe the effect of TCW in the management of hypertension.

## **MATERIALS AND METHODS**

This study was performed in the Department of Physiology of KIMS, after receiving necessary approval from the Institutional Committee for Ethics. For the purpose of the study 70 subjects were selected as first stage random sample using following inclusion and exclusion criteria. The subject should be of 30 to 50 years age group and should not have any other disease than Hypertension. Subjects below 30 years and above 50 years and subjects who are having any other diseases like diabetes, cardiovascular disease except hypertension are excluded.

Based on inclusion and exclusion criterion, 70 subjects were selected randomly as a sample for 45 days of the intervention program out of which 50 subjects continued till the end of the research study. Among them 30 subjects were grouped as

the experimental group and remaining 20 subjects were grouped as a control. The general information like name, age, gender, education, habits etc.; Anthropometric measurements like Height, weight, body mass index, dietary information were collected from all subjects. The experimental group was educated about consumption of 300ml/day fresh TCW. Control group was without any supplementation.

The supplementation was done for 45 days. Initial or pre intervention estimation of BP recording was done in all subjects. Three readings of BP were taken for more accuracy. BP measurement was done once in every 15 days of all subjects. After 45 days of supplementation, the effects of TCW on BP of primary hypertensive subjects were recorded. The results of pre and post intervention were statistically analyzed. The statistical techniques used are mean, standard deviation, standard error of mean and t-test ANOVA value.

## **RESULTS AND DISCUSSION**

Cardiovascular diseases caused 2.3 million deaths in India in the year 1990; this is projected to double by the year 2020. Hypertension is directly responsible for 57 percent of all stroke deaths and 24 percent of all coronary heart disease deaths in India<sup>13,14,15</sup>. Potassium is the most important ion in the living cell, affecting almost every cellular function. Potassium is a fundamental factor in BP regulation<sup>11</sup>. Increasing potassium intake has beneficial effects on human health. A high-potassium diet lowers BP in individuals with both raised BP and average population BP. Increasing potassium intake reduces cardiovascular disease mortality. This is mainly attributable to the BP-lowering effect and may also be partially because of the direct effects of potassium on the cardiovascular system. A high-potassium diet may also prevent or at least slow the progression of renal disease. An increased potassium intake lowers urinary calcium excretion and plays an important role in the management of hypercalciuria and kidney stones and is likely to

decrease the risk of osteoporosis. Low serum potassium is strongly related to glucose intolerance, and increasing potassium intake may prevent the development of diabetes that occurs with prolonged treatment with thiazide diuretics. Reduced serum potassium increases the risk of lethal ventricular arrhythmias in patients with ischemic heart disease, heart failure and left ventricular hypertrophy, and increasing potassium intake may prevent this. The best way to increase potassium intake is to increase the consumption of fruits and vegetables<sup>8</sup>. The main objective of the present study is to observe the effect of

supplementation of TCW on blood pressure of primary hypertensive subjects.

Table 1, shows the mean and SD of systolic and diastolic BP of control group (n=20) at initial, midterm and final period of study. The final systolic BP of control group was not decreased significantly (p=0.736) at 5% level. The final diastolic BP of control group was not decreased significantly (p=0.409) at 5% level. Control group was without any intervention and asked to follow the same routine as before the study period. This may be the reason for only a very slight decrease in BP.

**Table 1: Comparison of Blood Pressure of control group**

Blood Pressure	Time Point	Mean ± S.D.	F – value
Systolic Blood Pressure	Initial	141.2 ± 8.03	0.308 NS P= 0.736
	Midterm	139.3 ± 7.49	
	Final	140.0 ± 7.02	
Diastolic Blood Pressure	Initial	90.9 ± 3.46	0.908 NS P= 0.409
	Midterm	89.4 ± 4.31	
	Final	89.7 ± 3.33	

(NS = Not Significant)

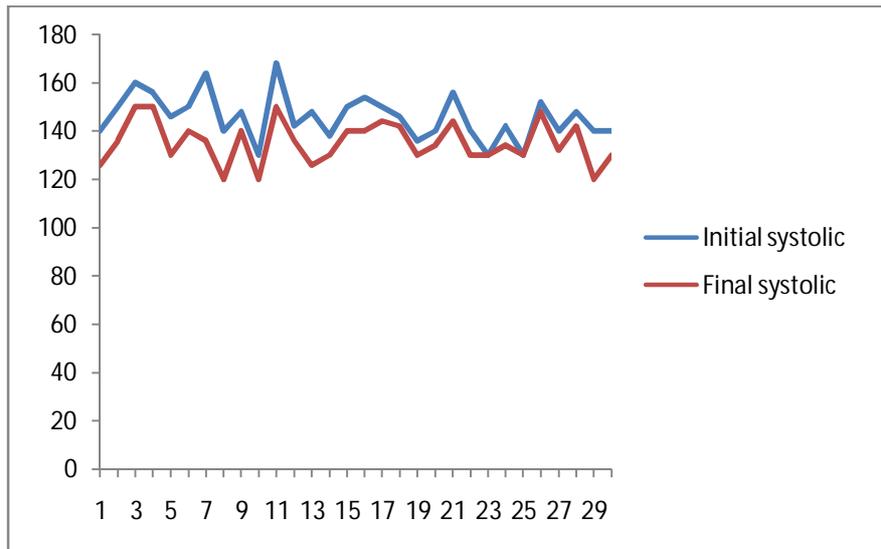
Table 2 shows the mean and SD of systolic and diastolic BP of experimental group (n=30) at initial, midterm and final period of the study. The final (post intervention) systolic BP of experimental group was decreased significantly than control group (p=0.002) at 5% level. The final (post intervention) diastolic BP of experimental group was decreased significantly than control group (p<0.00001) at 5% level. The systolic and diastolic BP of experimental group

was decreased by 10.5 mm Hg and 6.8 mm Hg respectively. The reduction in BP in the experimental group was highly significant than the control group. This significant decrease in blood pressure might be due to the supplementation of TCW. As TCW is rich in potassium (290 mg %), calcium (44 mg %), magnesium (10 mg %) and Vitamin C (2.4 mg %) has a beneficial effect on blood pressure of hypertensive subjects<sup>10, 11</sup>.

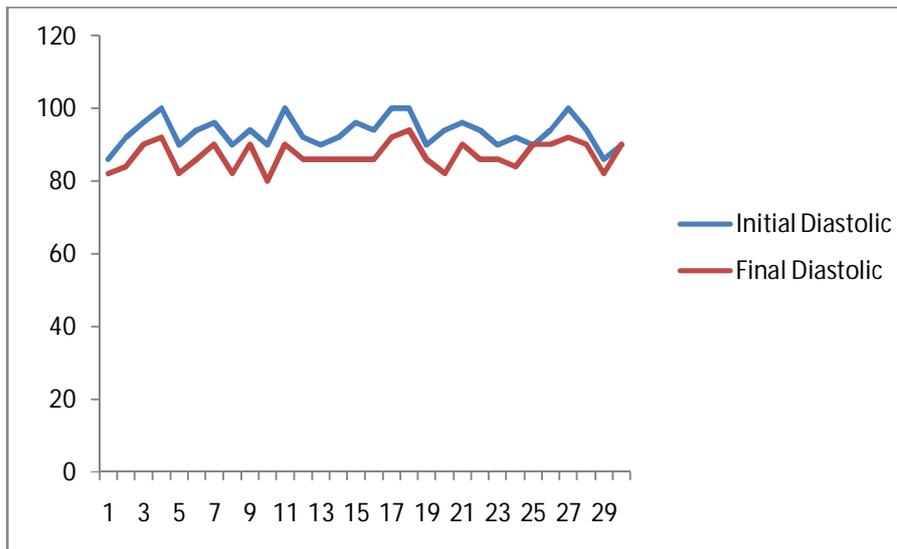
**Table 2: Comparison of Blood Pressure of Experimental group**

Blood Pressure	Time Point	Mean ± S.D.	F – value
Systolic Blood Pressure	Initial	145.8 ± 9.46	9.72 * P= 0.0002
	Midterm	139.4 ± 9.57	
	Final	135.3 ± 8.76	
Diastolic Blood Pressure	Initial	93.7 ± 4.03	22.2 * P < 0.00001
	Midterm	89.8 ± 4.31	
	Final	86.9 ± 3.66	

(\* = Significant at 5% level of significance)



**Fig:1. Comparison of systolic Blood pressure of Experimental group.**



**Fig:2: Comparison of diastolic blood pressure of experimental group**

The potassium causes vasodilatation and also improves the endothelial function. The magnesium has vasodilator property and also inhibits both the production of nitric oxide and contraction of vascular smooth muscle walls of arteries. Calcium and Vitamin C are also hypotensive. L-Arginine, a physiological substrate for the production of endothelium derived relaxing factor, nitric oxide (NO), which plays an important role in the regulation of vascular tone and homeostasis which is impaired in hypertension<sup>7</sup>.

## CONCLUSION

In the control group there was a very slight decrease in systolic and diastolic BP which was statistically not significant. In the experimental group systolic and diastolic BP was decreased by 10.5 mm Hg and 6.8 mm Hg respectively. The reduction in BP in the experimental group was statistically significant at the 5% level of significance. It indicates the consumption of the coconut water significantly decreases the blood pressure in primary hypertensive patients.

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