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Original article

EFFECT OF COCONUT WATER SUPPLEMENTATION ON BLOOD PRESSURE OF PRIMARY HYPERTENSIVE SUBJECTS .

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Abstract.

Objective:

To investigate the effect of Tender Coconut Water (TCW) on the blood pressure (BP) of Primary hypertensive subjects.

Materials and methods:

70 subjects were chosen at random for the 6-week intervention programme. Forty subjects were selected as the experimental group and given 300ml per day for six weeks, while the control group was instructed to adhere to the same regimen. Both groups underwent an initial, two mid-intervention (every 15 days), and a final (post-intervention) blood pressure measurement. The obtained data was analysed statistically.

Results:

The average systolic blood pressure of the experimental and control groups decreased from 145.8 mm Hg and 141 mm Hg, respectively, to 135.3 mm Hg and 140 mm Hg, respectively. The average diastolic blood pressure of the experimental and control groups decreased from 93.7 and 90.9 mmHg to 86.9 and 89.7 mmHg, respectively.

Conclusion:

Regardless of the aetiology of hypertension, TCW has a beneficial effect on blood pressure. TCW contains a high concentration of potassium, which induces vasodilation and enhances endothelial function.

Recommendation:

A complete medical and family history is recommended and should include values of blood pressure, risk factors, overall cardiovascular risk assessment, signs and symptoms of coexistent/hypertension illness, and symptoms of secondary hypertension.

Keywords: Hypertension, Systolic, diastolic blood pressure, Potassium, Tender Coconut water,
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1. Introduction.

Diabetes is a group of disorders characterised by elevated fasting and postprandial glucose concentrations and a deficiency in insulin or a decrease in insulin's glucose-lowering effects [1]. Diabetes is commonly associated with increased production of free radicals, a weakened antioxidant defence mechanism, and pathological complications. It is widely acknowledged that increased oxidative stress contributes to the development

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and progression of diabetes and its complications [2]. Diabetes (type 2) is associated with producing reactive oxygen species (ROS) and oxidative tissue injury [3, 4]. Under physiological conditions, an antioxidant defence system safeguards the body from the harmful effects of free radical production. Hyperglycemia and protein glycation may depress the natural antioxidant system in diabetes. Higher rates of free radical formation, resulting in the depletion of antioxidant defence components, may disrupt cellular functions, cause oxidative damage to membranes, and increase lipid peroxidation susceptibility.

Approximately 25% of the world's adult population has hypertension, and its prevalence is expected to increase by approximately 60% by 2025. Prehypertension (PHT) is associated with a 3-fold higher risk of developing hypertension and approximately twice as many cardiovascular diseases (CVD) as normotension [1, 2]. In subsequent studies conducted in India, the prevalence of hypertension has been shown to be on the rise, and it is now emerging as the greatest public health concern [5]. They are the leading cause of mortality in all developed nations, accounting for fifty percent of all deaths, and are also emerging as an important public health issue in developing nations, where they rank third with nearly sixteen percent of all deaths. Numerous developing nations are currently undergoing an epidemiological transition and are confronted with the double burden of communicable and noncommunicable diseases, which has severe repercussions for their extremely fragile economies [2].

The Dietary Approaches to Stop Hypertension (DASH) diet demonstrated that a diet abundant in vegetables and fruits (high in potassium) significantly reduced BP in PHT [6]. The World Health Organisation (WHO) recommends that adults consume at least 90 mmol/day (3,510 mg/day) of potassium from food, or 4700 mg/day based on the recommended daily allowance (RDA) [7]. Tender coconut water (TCW) is a typi- cal potassium-rich topical beverage [8]. In In- dia, however, research on the function of TCW in increasing potassium intake has never been conducted.

As dietary management of hypertension can prevent cardiovascular, renal, and numerous other maladies, this study was conducted to determine the effect of TCW on hypertension management. The primary objective of the present investigation is to evaluate the impact of TCW supplementation on the blood pressure of subjects with primary hypertension.

2. Materials and methods.

2.1. Study design and Population:

A tertiary care centre conducted this research. As a first-stage random sample for the study, 70 subjects were selected using the inclusion and exclusion criteria listed below. The subject must be between 30 and 50 years old and have no other diseases besides hypertension.

Criteria: Subjects below 30 years of age and above 50 years of age, as well as those with diabetes or cardiovascular disease other than hypertension, are excluded. 70 subjects were selected at random as a sample for 45 days of the intervention programme based on inclusion and exclusion criteria, and 50 of these subjects completed the research study.

Thirty subjects were assigned to the experimental group, while the remaining twenty were assigned to the control group. All subjects provided general information such as name, age, gender, education, routines, etc.; anthropometric measurements such as height, weight, and body mass index; and dietary information. The experimental group was instructed to consume 300ml of raw TCW per day. The control group received no supplements.

2.2. Data Collection:

The duration of the supplementation was 45 days. Initial or pre-intervention blood pressure recording was performed on all subjects. Three blood pressure readings were obtained for greater accuracy. Every subject's blood pressure was measured once every 15 days. After 45 days of supplementation, the effects of TCW on the blood pressure of subjects with primary hypertension were recorded. The pre- and post-intervention

outcomes were statistically analysed. Mean, standard deviation, standard error of mean, and the t-test ANOVA value are the statistical methods employed.

3. Results and Discussion.

A high-potassium diet may also prevent renal disease or at least delay its progression. A higher potassium intake reduces urinary calcium excretion, plays a crucial role in the management of hypercalciuria and kidney stones, and is likely to reduce the risk of osteoporosis. Low serum potassium is firmly associated with glucose intolerance, and increasing potassium intake may prevent the onset of diabetes caused by prolonged thiazide diuretic use. Reduced serum potassium increases the risk of fatal ventricular arrhythmias in patients with ischemic heart disease, heart failure, and hypertrophy of the left ventricle; increasing potassium intake may prevent this. The best method to increase potassium intake is to increase fruit and vegetable consumption [8].

In 1990, cardiovascular diseases caused 2.3 million fatalities in India; this number is expected to double by 2020 [9, 10]. 57 percent of all stroke fatalities and 24 percent of all coronary heart disease deaths in India are directly attributable to hypertension [11-14]. Potassium is the most essential ion in living cells, influencing nearly all cellular processes. Potassium is an essential component of BP regulation [15]. Potassium consumption has positive effects on human health. A high-potassium diet reduces blood pressure in both hypertensive and normotensive individuals. Increasing potassium intake reduces mortality from cardiovascular disease. This is primarily due to the blood pressure-lowering effect and may also be partially attributable to potassium's direct effects on the cardiovascular system.

Table 1 displays the mean and standard deviation of systolic and diastolic blood pressure for the control group (n=20) at the beginning, middle, and end of the study. At the 5% level, the final systolic BP of the control group did not decrease substantially (p=0.736). At the 5% level, the final diastolic BP of the control group did not decrease substantially (p=0.409). The control group received no intervention and was instructed to maintain the same routine as prior to the study period. This may account for a very modest decrease in blood pressure.

The mean and standard deviation of systolic and diastolic blood pressure for the experimental group (n=30) at the beginning, middle, and end of the study. At the 5% significance level, the ultimate (post-intervention) systolic BP of the experimental group was significantly lower than that of the control group (p=0.002). The final (post-intervention) diastolic blood pressure of the experimental group was markedly lower than that of the control group (p0.00001 at the 5% level). The systolic and diastolic blood pressure of the experimental group fell by 10.5- and 6.8-mm Hg, respectively. The reduction in blood pressure in the experimental group was significantly greater than that of the control group. This significant reduction in blood pressure may be the result of TCW supplementation. As TCW is rich in potassium (290 mg%), calcium (44 mg%), magnesium (10 mg%), and Vitamin C (2.4 mg%), it has a beneficial effect on hypertensive subjects' blood pressure [10, 11].

Potassium dilates blood vessels and enhances endothelial function. Magnesium has vasodilator properties and inhibits the production of nitric oxide as well as the contraction of the vascular smooth muscle walls of arteries. Vitamin C and calcium are also hypotensive. L-Arginine is a physiological substrate for the production of endothelium-derived relaxing factor, nitric oxide (NO), which plays a crucial role in the regulation of vascular tone and homeostasis, both of which are impaired in hypertension [7].

4. Conclusion.

There was a statistically insignificant decrease in systolic and diastolic blood pressure in the control group. Both systolic and diastolic blood pressure decreased by 10.5 mm Hg and 6.8 mm Hg, respectively, in the experimental group. At the 5% level of significance, the reduction in BP in the experimental group was statistically signifi-

Table 1: **Comparison of Blood pressure of both groups**

	Blood Pressure	Time Point	Mean ± S.D.
Control Group	Systolic Blood Pressure	Initial	140.9 ± 7.99
		Midterm	138.9 ±7.50
		Final	139.9 ± 7.01
	Diastolic Blood Pressure	Initial	91.0 ±3.47
		Midterm	89.5 ± 4.30
		Final	90.1 ± 3.34
Experimental group	Systolic Blood Pressure	Initial	146.1 ± 9.47
		Midterm	140.1 ± 9.58
		Final	134.8 ± 8.75
	Diastolic Blood Pressure	Initial	93.8 ± 4.00
		Midterm	90.0 ± 4.30
		Final	87.0 ± 3.67

cant. It indicates that consumption of coconut water substantially reduces blood pressure in patients with primary hypertension.

5. Limitations.

The limitations of this study include a small sample population who were included in this study. The findings of this study cannot be generalized for a larger sample population. Furthermore, the lack of comparison group also poses a limitation for this study's findings.

6. Recommendation.

A complete medical and family history is recommended and should include values of blood pressure, risk factors, overall cardiovascular risk assessment, signs and symptoms of coexistent/hypertension illness, and symptoms of secondary hypertension.

7. Acknowledgment.

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8. List of abbreviations.

TCW- Tender Coconut Water
BP- Blood Pressure
PHT- Prehypertension
CVD- cardiovascular diseases
DASH- Dietary Approaches to Stop Hypertension
WHO- World Health Organisation
RDA- recommended daily allowance
ANOVA- Analysis of Variance
SBP- Systolic Blood Pressure
DBP- Diastolic Blood Pressure
NO- nitric oxide

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10. Conflict of interest:

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