

Research Article

A Study to Assess the Effectiveness of Beetroot Juice on Blood Pressure Level among Patients with Hypertension at Selected Hospital Davanagere

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Abstract

Objectives: a) The main objective of the study is to assess the pretest level of blood pressure in patients with Hypertension among experimental and control group. b) To evaluate the effectiveness of beetroot juice on blood pressure level on hypertensive patients in the experimental group. c) To determine the association of posttest blood pressure level in patients with Hypertension in experimental group with selected demographic variables.

Design: Quantitative approach and Quasi experimental Nonequivalent control group design was adopted for this study.

Setting: The study was conducted at CG Hospital Davanagere, Karnataka. Pilot study was done on 10 patients and tool was found to be feasible.

Intervention: The intervention applied in this study was consumption of beetroot juice for 10 days.

Data Collection Procedure: Bio-physiological tool was used to measure the blood pressure level. Suggestions and opinions from experts were obtained to use the tool among hypertensive patients. The data collected were tabulated and analyzed by descriptive and inferential statistics.

Conclusion: This study shows that the selected beetroot juice consumption intervention among hypertension patients had a significant effect on the blood pressure level.

Keywords: Hypertension, Beetroot Juice, Experimental Group, Control Group.

Introduction

Hypertension occurs in the third decade of life and is a crucial treatable risk factor to prevent cardiovascular morbidity and mortality in multiple pathological mechanisms drive hypertension. Nitric oxide is a key mediator of vasodilation and can be produced by vascular endothelial cells via the conversion to L-arginine to L-citrulline by nitric oxide synthase. Beetroots contain the highest concentration of naturally occurring nitrate with an average of 250 mg/100 g. Beetroot juice increases serum nitric oxide metabolites, promotes vasodilation and reduces BP. The anti-hypertensive effect of Beetroot juice is attributed to the direct conversion of dietary nitrate to nitric oxide by nitrous-converting bacteria in the oral mucosa (the entero-salivary nitrate-nitrite-NO pathway). In this context, the dietary approach to stop hypertension, study showed an average reduction in systolic BP of 5.2 mmHg which is based on the 10-year Framingham risk score is associated with a 13% reduction in coronary heart disease, myocardial infarction and stroke. Moreover, beetroot juice is well accepted by study participants as it is a natural substance with no reported harmful effects and has up to 90% self-reported compliance. There are no expected or reported drug interactions with beetroot juice.¹

Sunil and Sharma studied on the effectiveness of dietary nitrate supplementation with beetroot juice in reduction of blood pressure among essential hypertensive patients admitted in general hospital, harihara taluk, davanagere district. They have reported that beetroot juice administration showed the improvement in both systolic and diastolic blood pressure of patients within 24 hours of time period². High blood pressure, also called hypertension, is elevated pressure of the blood in the arteries. Hypertension results when the heart pumps blood with excessive force and when the body's smaller blood

vessels (known as the arterioles) narrow, so that blood flow exerts more pressure against the vessels' walls. Such pressure can injure blood vessels in the heart, kidneys, the brain, and the eyes. The blood pressure is a persistent elevation of systolic pressure >140 mmHg and diastolic pressure >90 mmHg. The systolic pressure is the force that blood exerts on the artery walls as the heart contracts to pump out the blood. High systolic pressure is now known to be a greater risk factor than diastolic pressure for brain, heart, kidney, and circulatory complications and for death, particularly in middle-aged and elderly adults.³ The diastolic pressure is the measurement of force as the heart relaxes to allow the blood to flow into the heart. High diastolic pressure is a strong predictor of heart attack and stroke in young adults. Health dangers from blood pressure may vary among different age groups and depending on whether systolic or diastolic pressure (or both) is elevated.¹

Statement of the Problem

A study to assess the effectiveness of beetroot juice on blood pressure level among patients with hypertension at selected hospital Davanagere.

Objectives

- a) To assess the pre-test level of blood pressure in patients with Hypertension among experimental and control group.
- b) To evaluate the effectiveness of beetroot juice on blood pressure level among hypertensive patients in the experimental group.
- c) To determine the association of post-test blood pressure level in patients with Hypertension in experimental group with selected demographic variables.

Hypotheses

H₁: There will be a significant difference between the level of blood pressure among hypertensive patients before and after intake of beetroot juice.

H₂: There will be a significant association of the mean blood pressure level with selected demographic variables.

Research Methodology

Research Variables

Independent variable: Beetroot juice.

Dependent variable: Blood pressure level.

Demographic variable: Age, sex, education, marital status and occupation, nature of work, income, family type, family history and food habits.

Research approach: Quantitative approach was used for this study.

Research design: The research design adopted was quasi experimental non-equivalent control group pre-test and post-test design.

Research setting: CG Hospital Davanagere, Karnataka.

Population

Target population: Hypertensive patients admitted in CG Hospital Davanagere, Karnataka.

Accessible population: Hypertensive patients admitted in CG Hospital Davanagere, Karnataka.

Sampling and Sampling Technique

Sample: Hypertensive patients admitted in CG Hospital Davanagere, Karnataka.

Sampling technique: The researcher adopted non-probability sampling-purposive sample technique to select the clients for the study.

Sample size: 60

Criteria for Sample Selection

Inclusion criteria

- ✓ Hypertension patients admitted at CG Hospital Davanagere, Karnataka.
- ✓ Hypertension patients who were diagnosed and on treatment.
- ✓ Hypertension patients who were in the age group of 35 years and above.
- ✓ Hypertensive clients who were willing to participate in the study.
- ✓ Hypertension client taking treatment at CG Hospital Davanagere, Karnataka.
- ✓ Both genders were included in this study.

- ✓ Patients who are conscious and stable.

Exclusion criteria

- ✓ Patients with diabetes mellitus.
- ✓ Patients on dialysis.
- ✓ Patients having allergy to beetroot.
- ✓ Patients having difficulty in swallowing.
- ✓ Pregnant women.

Questionnaire to Assess the Blood Pressure and Baseline Information

A structure interview schedule was developed based on the objective of the study through review of literature on related studies, journals and books, opinion from the experts. All these helped in the ultimate development of the tool.

Sphygmomanometer

The standard instrument used to measure blood pressure is called as Sphygmomanometer. Measurements are given as units of mercury, which has filled the central column in standard sphygmomanometers for years. An inflatable cuff with a meter attached is placed around the patient's arm and the arm being used is around the level of the heart. The inflated cuff briefly interrupts the flow of blood in the artery, which then resumes as the cuff is slowly deflated. The person taking the blood pressure listens through a stethoscope. The first pumping sound heard is recorded as the systolic pressure, and the last sound is the diastolic pressure. The lowest level in the scale is 0 and the highest level is 300 mm Hg.

Steps of Intervention

- ✓ A moderate sized beetroot of 150gm was taken; beetroot skin was peeled off and chopped into small pieces.
- ✓ These sliced pieces were put in to a mixer and 100ml of water was added to it. It was grinded for 1 whole minute, after grinding, from 150 gm of beetroot juice mixed with 100ml of water; to get 250 ml of beetroot juice.
- ✓ The juice was transferred from mixer to a clean flask. For intervention group pre assessment of blood pressure was done after two and half hours of regular intake of morning medication.
- ✓ As soon as after checking BP, using ounce glass 250 ml beetroot juice was collected from the flask and administered to the patients.
- ✓ Patient was advised to take beetroot juice within 30 minutes of time. After two hours of beetroot juice intake, posttest was done.
- ✓ Then every four-hour interval posttest was continued until next day cycle starts. Same was continued for Comparison group, but no beetroot juice was provided for patients. The study was continued till the patient got discharged.

Findings of the Study

Section-A

The below table reveals the background data among hypertensive patients for experimental and control group such as age, sex, educational status, marital status, occupation, nature of work, monthly income, type of family, family history of hypertension and food habits. In the aspect of age, in the experimental group about 5(16.7%) belonged to the age group of 35-45 years, 8(26.7%) were in the age group of 46-55 years, 13(43.3%) belonged to the age group of 56-65 years and 4(13.3%) were belonged to more than 65 years. Whereas in the control group 8(26.7%) belonged to 35-45 years of age group, 6 (20%) were between 46-55 years, 14(46.6%) belonged to 56-65 years age and 2 (6.7%) were more than 65 years of age. With respect to sex, majority of samples were females both in the experimental group 22(73.3%) and control group 18(60%). Whereas the male samples in the experimental group were 8(26.7%) and control group 12(40%) respectively. When the education is considered, in the experimental group, about 6(20%) studied primary education, 5(16.7%) had middle education, 6(20%) studied high school, 5(16.7%) studied higher secondary, 2(6.67%) were had professional education and 6(20%) had no formal education. In control group, 8(26.67%) had primary education, 3(10%) were had middle education, 8(26.7%) studied up to high school, 6(20%) had higher secondary education, 3(10%) had professional education 2(6.7%) had no formal education. When marital status is considered, in both the experimental 30(100%) and control group 30 (100%) were married. While considering the occupation of participants of study, in experimental group 3(10%) were doing professional work, 12(40%) were working as load carrying work, farmer, and as mill worker. Among them 4(13.3%) were doing clerical work, whereas 11(36.7%) members were unemployed.

In the control group 2(6.7%) were professional worker, 11(36.7%) working as load carrying work, farmer and millworker, 4(13.3%) clerical work at shop and 13(43.3%) were unemployed.

Table 1. Distribution of demographic variables of the patients with hypertension.

Demographic variables		Group			
		Experimental		Control	
		Number of patients	%	Number of patients	%
Age	35-45 years	5	16.7	8	26.7
	46-55 years	8	26.7	6	20
	56-65 years	13	43.3	14	46.6
	>65 years	4	13.3	2	6.7
Sex	Male	8	26.7	12	40
	Female	22	73.3	18	60
Educational status	Primary school	6	20	8	26.7
	Middle school	5	16.7	3	10
	High school	6	20	8	26.7
	Higher secondary	5	16.7	6	20
	Professional	2	6.7	3	10
	No formal education	6	20	2	6.7
Marital status	Unmarried	0	0.0	-	0.0
	Married	30	100	30	100
	Divorced	0	0.0	0	0.0
Occupation	Professional	3	10	2	6.7
	Load work/farmer/mill worker	12	40	11	36.7
	Clerical/shop keeper	4	13.3	4	13.3
	Unemployed	11	36.7	13	43.3
Nature of work	Sedentary/house wife	15	50.0	17	56.7
	Moderate	3	10	2	6.7
	Heavy	12	40	11	36.7
Income (monthly)	<2000	2	6.7	0	0.0
	2001-5000	10	33.3	10	33.3
	5001-10,000	18	60	20	66.7
Type of family	Nuclear	17	56.6	16	53.3
	Joint	11	36.7	14	46.7
	Separated	2	6.7	0	0.0
Family history of hypertension	Father	13	43.3	10	33.3
	Mother	10	33.3	10	33.3
	Paternal	5	16.7	7	23.4
	Maternal	2	6.7	3	10
Food habits	Vegetarian	4	13.3	2	6.7
	Mixed vegetarian	26	86.7	28	93.3

With regard to nature of work, in the experimental group, about 15(50%) had sedentary work, 3(10%) had moderate work, 12(40%) had heavy work. In control group about 17(56.7%) had sedentary work, 2 (6.7%) had moderate work, and 11(36.7%) had heavy work. Regarding the family income per month is considered, in the experimental group about 2 clients (6.7%) had less than Rs.2000 per month, 10(33.33%) had Rs.2001-5000, clients of 18(60%) had Rs.5001-10000 family income respectively. In the control group, about 10 (33.3%) had earning Rs.2001-5000 per month, 20(66.7%) had family income between Rs 5001-10,000 respectively.

With regards to the type of family, about 17(56.6%) belonged to nuclear family, 11(36.7%) belonged to joint family and 2(6.7%) were separated in the experimental group. Whereas in the control group, 16(53.3%) belonged to nuclear family, 14 (46.7%) belonged to joint family and no one was separated. With the view of family history of hypertension, in the experimental group, 13(43.3%) had father with hypertension, 10(33.3%) had mother with hypertension, 2(6.7%) had maternal grandparent with hypertension and

5(16.7%) had paternal grandparents. Whereas in the control group, 10(33.3%) had father with hypertension, 10(33.33%) had mother with hypertension, 7(23.4%) had paternal grandparent with hypertension and 3(10%) had maternal grandparent hypertension. When considering about the food habit, in the experimental group, 4(13.3%) were vegetarians and 26(86.7%) were mixed vegetarians. In the control group, 2(6.7%) were vegetarians and 28(93.3%) were mixed vegetarians respectively.

Section-B

Table 2. Distribution of pre-test systolic blood pressure level among clients with hypertension in experimental and control group.

Blood pressure level		Pre-test			
		Experimental		Control	
		N	%	N	%
SBP	<120mmHg (Normal hypertension)	0	0.00	0	0.00
	120-139mmHg (Pre hypertension)	0	0.00	0	0.00
	140-159 (Stage I hypertension)	14	46.7	15	50
		16	53.3	15	50
Total		30	100	30	100

The above table represents that the experimental group in the pre-test majority of hypertensive patients 16(53.3%) were in the range of 150-159 mmHg remaining 14(46.7%) were in the range of 140-149mmHg. In the control group, 15(50%) of subjects were in the range of 140-149 mmHg and 15(50%) of subjects were in the range 150-159mmHg in systolic blood pressure.

Table 3. Pre-test diastolic blood pressure level in clients with hypertension among experimental and control group.

Blood pressure level		Pre-test			
		Experimental		Control	
		N	%	N	%
DBP	<80mmHg	0	0.00	0	0.00
	80-89mmHg	0	0.00	0	0.00
	90-99mmHg	30	100	30	100
Total		30	100	30	100

The experimental and control group in the pretest, all the subjects were in the range of 90-99 mmHg in diastolic blood pressure.

Section-C

Table 4. The mean, SD, and 't' value of systolic blood pressure level between pretest and posttest in experimental and control group.

Test	Systolic blood pressure							
	Pre-test				Post-test			
	Mean	SD	't' value	Significance	Mean	SD	't' value	Significance
Experimental group	145.33	5.34	0.297	p > 0.05	111.67	3.82	29.98	p < 0.05
Control group	145	5.00			142.67	4.49		

The above table depicts the effectiveness of Beetroot juice among hypertensive patients in the experimental group. The mean pretest systolic blood pressure level was 145.3 with standard deviation of 5.34 and the post-test mean was 111.67 with standard deviation of 3.82 respectively. The test of significance was calculated using paired t-test. The obtained t-value is 25.98=0.001 with DF=29.98(p<0.05), which was statistically significant as the preset level of significant is 0.05.

Table 5. The mean, SD and 't' value of diastolic blood pressure level between pretest and posttest in experimental and control group.

Test	Diastolic blood pressure							
	Pre-test				Post-test			
	Mean	SD	't' value	Significance	Mean	SD	't' value	Significance
Experimental group	91.5	2.29	0	p > 0.05	71.3	3.46	25.98	p < 0.05
Control group	91.5	2.29			90.17	0.91		

The above table represents that in diastolic blood pressure levels, the pretest mean was 91.5 with standard deviation of 2.29 and post-test mean was 71.3 with standard deviation of 3.46. The obtained t-value was 25.98 ($p < 0.05$).

Table 6. The frequency and percentage distribution of post-test systolic blood pressure level for experimental and control group.

Blood pressure level		Post-test			
		Experimental		Control	
		N	%	N	%
SBP	<120mmHg (Normal hypertension)	25	83.3	0	0.00
	120-139mmHg (Pre hypertension)	5	16.7	0	0.00
	140-159mmHg	0	0.00	30	100
Total		30	100	30	100

The above table depicts that in the post test, among the experimental group 83.3% of the stage I hypertension clients were in the range of <120 mmHg (Normal hypertension) of systolic blood pressure, 16.7% were in the range of 120-139mmHg (Pre hypertension) of systolic blood pressure level. Among the control group, 100% where Hypertensive subjects were remains in the range of 140-159mmHg.

Table 7. The frequency and percentage distribution of post-test diastolic blood pressure level for experimental and control group.

Blood pressure level		Post-test			
		Experimental		Control	
		N	%	N	%
DBP	<80mmHg	25	83.3	0	0
	80-89mmHg	5	16.7	0	0
	90-99mmHg	0	0.00	30	100
Total		30	100	30	100

The above table explains that in the post test, among the experimental group 25(83.3%) of the hypertension patients were in the range of <80 mmHg (Normal hypertension) of diastolic blood pressure, 5(16.7%) was in the range of 80-89mmHg (Prehypertension) of diastolic blood pressure level.

Section-E

Table 8. Compare the pre-test and post-test level of blood pressure in experimental and control group.

S/N	Test	No	Systolic blood pressure				Paired 't' test value mean	Level of significance
			Experimental group		Control group			
			Mean	SD	Mean	SD		
1	Pre-test	30	145.33	5.34	145	5.00	29.98	0.001 significance
2	Post-test	30	111.67	3.82	142.61	4.49		
Diastolic blood pressure								
1	Pre-test	30	91.5	2.29	91.5	2.29	25.98	0.001 significance
2	Post-test	30	71.3	3.46	90.17	0.91		

In experimental clients the systolic blood pressure lowers from 145.33 to 111.67 in post-test due to beetroot juice consumption the difference is 33.66 mm of Hg in systolic blood pressure, whereas the diastolic blood pressure level lower from 91.5 to 71.3 and the difference is 20.2 in post-test. This reduction indicates that the intervention is statistically significant.

Conclusion

Consuming beetroot juice is very effective and feasible drink to all. It is low cost and locally available vegetable which can be affordable by all set of people. Hypertensive patients are influenced by the demographic variables. Based on the method of sample selection, the findings may be generalized to individual with hypertension. There was association between post-test blood pressure level and age, sex, family history, food habits, occupation. The study findings provide the statistical evidence which indicates that beetroot juice is one of the best alternative therapies which may be used to lower the blood pressure level.

Declarations

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