

# Effect of hibiscus sabdariffa on blood pressure in patients with stage 1 hypertension

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## ABSTRACT

Using different drug regimens has been proved to have effective effects on lowering blood pressure, but the adverse effects of long-term usage such medications is evident. According to recent trend in using herbal and traditional medicines, researchers have been focused on evaluating the effect of different herbals on managing hypertension. The aim of the present study is the evaluation of the antihypertensive effect one of these herbs, sour tea (*Hibiscus sabdariffa*), on stage one hypertension. Patients with stage one hypertension who were diagnosed by a cardiologist has been included in the present clinical trial after giving informed consent. The patients were divided into two groups. The control and case group received the same lifestyle and dietary advices for controlling blood pressure. The case group received two standard cup of sour tea every morning for 1 month. The blood pressure of both groups was documented at baseline and at the end of the study and the results were analyzed using SPSS software. A total of 46 patients participated in this study and there was no significant difference in terms of age and body mass index between groups. There was a significant reduction in systolic blood pressure in both groups, but the mean reduction in systolic and diastolic blood pressure was significantly higher in the case group ( $P = 0.004$  and  $P < 0.001$ , respectively). Using *H. sabdariffa* as sour tea two times a day can be effective in managing blood pressure in stage one hypertension along with lifestyle and dietary modification.

**Key words:** Diastolic pressure, *Hibiscus sabdariffa*, hypertension, systolic pressure

## INTRODUCTION

Hypertension has been considered as a risk factor of various diseases including ischemic heart and cerebrovascular disease as well as chronic kidney disease. Hypertension also accounts for increases in disability-adjusted life years and deaths worldwide.<sup>[1-3]</sup> The global prevalence of hypertension among adults was 31.1% and its burden was higher in

low- and middle-income countries.<sup>[4]</sup> In addition, 26.6% of the population of Iran are hypertensive.<sup>[5]</sup> It should be noted that in developing countries, insufficient treatment and unawareness, make the management of hypertensive individuals more challenging for healthcare systems.<sup>[6,7]</sup>

Good blood pressure control can prevent adverse cardiologic outcome including heart attacks and heart failures.<sup>[8]</sup> There are different classes of antihypertensive drugs such as thiazides, beta-blockers, calcium channel blockers, angiotensin II receptor blockers, and alpha-blockers which are used clinically to treat hypertension.<sup>[9]</sup> Based on 2017 American College of Cardiology/American Heart Association

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guideline, from 45.6% of hypertensive adults in united states, 36.2% were recommended to use antihypertensive medications which approximately half of them still had a higher blood pressure than the goal threshold.<sup>[10]</sup> Thus, there is an urgent need for developing management strategies for this physiological disorder. On the other hand, there is an emerging use of herbal medicine (HM) as an alternative to chemical medicine (CM) which could have many reasons including side effects of CM.<sup>[11]</sup> Putting these together with positive beliefs and experiences of HM among people and their traditions, makes them more eager to trust and use herbal medication.<sup>[11]</sup> Traditions suggested herbs such as garlic, onion, Chinese herbal medicine, black and green tea, and sour tea or *Hibiscus sabdariffa*. Some studies have proven some of these medications positive effects.<sup>[12-24]</sup> The latter one, which is our experimental agent, is a plant containing carbohydrates, proteins, fatty acids, flavonoid, minerals, and vitamins. Studies mentioned that this herb has anticancer, antibacterial, anti-oxidant, nephro- and hepato-protective, diuretic, anti-cholesterol, anti-diabetic, and anti-hypertensive properties.<sup>[25,26]</sup> Despite the frequent usage of this alternative medicine among people, there is not adequate evidence and enough knowledge about its effectiveness in different medical conditions. Thus, knowing more details about this plant and conducting scientific and evidence-based studies seems to be necessary. According to these facts, this study aimed to evaluate the effect of *H. sabdariffa* on blood pressure.

## MATERIALS AND METHODS

The present randomized controlled clinical trial was conducted to evaluate the effectiveness of sour tea (*H. sabdariffa*) on patients with stage one hypertension referred to an outpatient cardiology clinic in Imam Reza Hospital in Mashhad, Iran. Every patient who was aged between 18 and 70 years with stage 1 hypertension who were diagnosed by the same cardiologist were enrolled in the present study. These patients had systolic and diastolic blood pressure ranging from 130 to 139 and 80–89 mmHg, respectively. These patients did not have any previous medical illness, and none of them were pregnant or breastfeeding. According to this criterion, 46 patients were divided into two experimental and control group. After taking the informed consent and according to the declaration of Helsinki, patients' demographic information including age, gender, and body mass index was recorded. Blood pressure was taken by Riester minimums II Aneroid Sphygmomanometer under the consideration of a specialist by the same researcher which was not aware of the present study. The manometer cuff was putted on brachial artery as its edge was 2 cm upper the elbow brachial artery pulse. Blood pressure was taken in sited position for three times with 5 min' intervals. The average of three attempts was recorded. Twenty-three patients in experimental group received nonmedical treatment advices and two standard

cup of sour tea (each cup with one sour tea bag containing 1.25 g *H. sabdariffa* (480 mL/d)) every day morning and night for 1 month (they did not use any other kind of teas). The instructions for using tea bags were given to the participants by the same researcher. All the tea bags were purchased from same reliable herbal shop and prescribed freely for the study participants. The other group only received the same nonmedical treatment advices as the control group. These advices included lowering weight under the consideration of a nutrition specialist, recommendation to have Dietary Approaches to Stop Hypertension (DASH), decreasing sodium and increasing potassium under the consideration of a nutrition specialist, and doing aerobic exercises at list 5 days a week for 30 min. The patients were visited by a cardiologist before and after the treatment, and their blood pressure was taken.

## Ethical consideration

The proposal of our study was approved by the Institutional Ethics Committee of Mashhad University of Medical Sciences.

## Statistical analysis

Data were analyzed using the statistical package for social sciences software version 22 (IBM Inc. Chicago, IL, USA). Continuous variables were checked for normality using the Shapiro–Wilk test. As all the continuous variables were normally distributed, the mean and standard deviation were used to present data. Categorical variables were presented using frequency and percentage. Comparison of continuous variables between groups was performed using the independent Student's *t*-test, whereas categorical variables were compared using the Chi-square test. Repeated measures analysis of variance (ANOVA) was Performed to assess the time and group effects. The statistical significance was defined as  $P < 0.05$ , and the confidence level was 0.95.

## RESULTS

A total of 46 participants (23, 50% in the tea group and 23, 50% in control group) participated in this study. The mean age of study participants was  $49.83 \pm 3.38$  years. The mean body mass index (BMI) of the participants was  $28.74 \pm 3.50$  kg/m<sup>2</sup>. There was no significant difference in terms of age and BMI between groups [Table 1]. Among the study participants, 25 (54.3%) were male and 21 (45.7%) were female. Among the intervention group, 12 participants (48.0%) were male and 11 participants (52.4%) were female, while in the

**Table 1: Comparison of the study variables at baseline between groups**

Variable	Intervention group (n=23)	Control group (n=23)	t	P
Age	49.87±3.51	49.78±3.33	-0.09	0.93
BMI	29.17±3.56	28.30±3.46	-0.84	0.40

BMI: Body mass index

control group, 13 participants (52.0%) were male and 10 participants (47.6%) were female. There was no significant difference in gender distribution pattern between the study groups ( $\chi$  (df = 1) = 0.09,  $P = 0.77$ ).

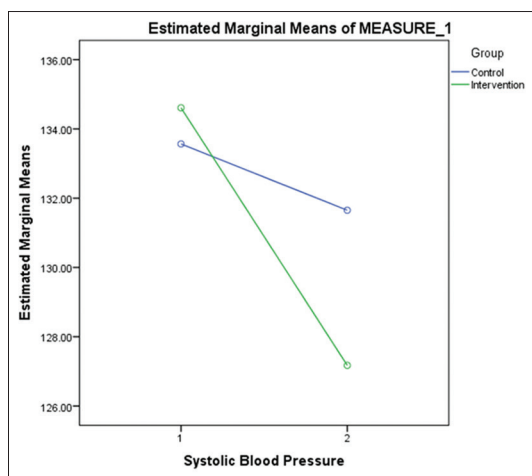
Repeated measures ANOVA revealed a significant time ( $P < 0.001$ ), group ( $P < 0.001$ ) and time\*group ( $P < 0.001$ ) effect for systolic blood pressure. There was no significant difference between groups at baseline ( $P = 0.18$ ). There was a significant reduction in systolic blood pressure in both groups ( $P < 0.05$ ), but the mean reduction in systolic blood pressure was significantly higher in the intervention group (-7.43 mmHg) compared to the control group (-1.91 mmHg) ( $P = 0.004$ ) [Table 2 and Figure 1].

Repeated measures ANOVA revealed a significant time ( $P < 0.001$ ), group ( $P = 0.002$ ) and time\*group ( $P = 0.001$ ) effect for diastolic blood pressure. There was no significant difference between groups at baseline ( $P = 0.88$ ). There was a significant reduction in diastolic blood pressure in both groups ( $P < 0.05$ ) but the mean reduction in diastolic blood pressure was significantly higher in the intervention group (-6.70 mmHg) compared to the control group (-3.96 mmHg) ( $P < 0.001$ ) [Table 2 and Figure 2].

There was no significant difference between genders in terms of changes in systolic and diastolic blood pressure ( $P > 0.05$ ) [Table 3].

## DISCUSSION

The present clinical trial revealed that sour tea can be an effective medication for lowering blood pressure in individuals with stage 1 hypertension. The blood pressure was also decreased in control group after 1 month which could be due to nonmedical advice such as lowering weight, using DASH regiment, decreasing sodium and increasing potassium, as well as performing aerobic exercises.

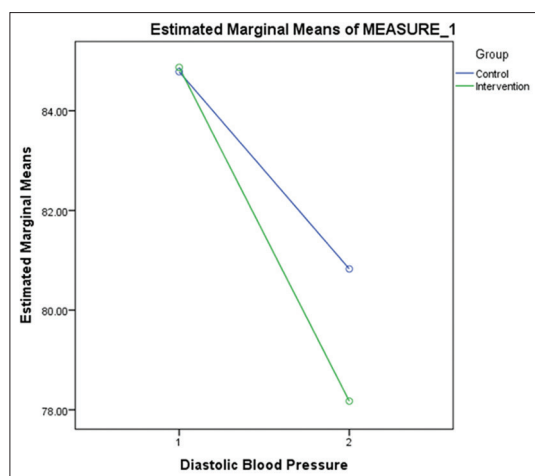


**Figure 1:** Changes in systolic blood pressure among intervention and control groups during the study

**Table 2: Comparison of systolic and diastolic blood pressure between the study groups at baseline**

Variable	Intervention			Control		
	Baseline	End of study	Mean difference	Baseline	End of study	Mean difference
SBP	134.61 ± 2.67	127.17 ± 1.37	-7.43	133.56 ± 2.57	131.65 ± 1.67	-1.91
DBP	84.87 ± 1.87	78.17 ± 2.01	-6.70	84.78 ± 2.09	80.83 ± 1.43	-3.96
				Baseline versus end of study	Baseline versus end of study	Baseline versus end of study
				<0.001**	0.004**	0.18
				<0.001**	<0.001**	0.88
						<0.001**
						<0.001**

\*\*Significant at  $\alpha = 0.01$ . SBP: Systolic blood pressure, DBP: Diastolic blood pressure



**Figure 2:** Changes in diastolic blood pressure among intervention and control groups during the study

**Table 3: Comparison of systolic and diastolic mean difference between genders**

Variable	Male	Female	t	P
SBP	-4.32±4.1	-5.09±4.19	0.62	0.53
DBP	-5.36±2.87	-5.29±3.13	-0.08	0.93

SBP: Systolic blood pressure, DBP: Diastolic blood pressure

*H. sabdariffa* has been studied in different clinical and experimental studies. The safety of *H. sabdariffa* tea and extracts have been stated in the literature.<sup>[25]</sup> Its noteworthy to mention that this herbal medicine has been considered as an effective factor for reducing and up taking free radicals. Furthermore, improving lipid profile is another therapeutic effect of the sour tea. Anthocyanins of *H. sabdariffa* can inhibit low-density lipoprotein oxidation and therefore decrease the atherosclerotic process.<sup>[27]</sup> Moreover, it has been showed that *H. sabdariffa* has a compound that causes nitric oxide release from vascular endothelium which follows by kidney filtration increase, a mechanism that clears its diuretic effect so on blood pressure.<sup>[28]</sup> The main limitation of suggesting *H. sabdariffa* as a blood pressure lowering agent or an anti lipidemic medication is the heterogeneity of clinical trials' protocols. Different therapeutic doses has been reported for achieving the beneficial effect of sour tea.<sup>[27]</sup> Haji Faraji *et al.* have conducted one of the first studies about the effect of *H. sabdariffa* on blood pressure.<sup>[13]</sup> As same as our study, they have achieved similar result indicating the effect of sour tea on lowering the blood pressure. Furthermore, they have revealed that 3 days after stopping the treatment, both systolic and diastolic blood pressure was elevated to 7.9% and 5.6%.<sup>[13]</sup> Furthermore, the most recent meta-analysis about this tea has demonstrated that *H. sabdariffa* have significant effect on lowering both systolic and diastolic blood pressure.<sup>[23]</sup> Moreover, the sour tea has also antihypertensive effect on diabetic patients with mild hypertension.<sup>[18]</sup> A recent study from our country has reported the effective effect of sour

tea on lowering blood pressure in a 100 mildly hypertensive diabetic patients. They have used greater amount of tea for their patients and achieved the same goal as our study on nondiabetic patients.<sup>[29,30]</sup> Based on current study results and similar studies, with regard to positive beliefs of this herbal medicine usage among people, considering sour tea in patients' diet along with life style modification as a treatment could be effective on high blood pressure.

### Limitation

The limitations of the study were our small sample size due to restricted time with regard to enrolling patients and only need to be conducted in one academic center. Poor assistance of patients was also restricted the sample of our study.

### CONCLUSION

Using antihypertensive chemical medication has its own side effects and limitations. However, using herbal medicine could be a considerable choice with lesser adverse effects if used within appropriate amounts. In our population, positive beliefs about herbal medicine among people make them more eager to trust and use herbal medication. According to the current study results, consumption of sour tea (*H. sabdariffa*) could effectively lower blood pressure in patients with stage 1 hypertension. Thus, concerning this herb as a medicine for hypertensive people seems beneficial. However, further investigation is needed to clear its mechanisms and effectiveness details in longer follow ups.

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Nil.

### Conflicts of interest

There are no conflicts of interest.

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