

Effect of Sour Tea (Hibiscus Sabdariffa) on Blood Pressure Among Patients with Hypertension

Maysaa Adel Kadhim^{1*}, Besmah Mohammed Ali², Remal Adel Kadhim³

¹MBCChB. Family medicine specialist – Clinical Nutrition Fellowship, Arab Board. Iraqi Ministry of Health and Environment, Baghdad, Iraq.

²MBCChB. Consultant community specialist, Head of scientific counsel of clinical nutrition/Arab board. Iraqi Ministry of Health and Environment, Ghazi Al Hariri hospital for surgical specialties, Medical city Directorate, Baghdad, Iraq.

³MBCChB. Family medicine specialist – Clinical Nutrition Fellowship, Arab Board. Iraqi Ministry of Health and Environment, Baghdad, Iraq.

Email: dr_maysaa80@yahoo.com

Abstract

Background Hibiscus sabdariffa is a red succulent flower petal that contains many plant acids and is rumored for its ability to lower blood pressure; around 1.28 billion adults have hypertension. it also affects the lives of adults between 20 to 40 years of age Objective: The current study aims to evaluate the effectiveness of sour tea (Hibiscus sabdariffa) in lowering blood pressure among Iraqi patients with hypertension Patients and methods A randomized, controlled clinical trial to study the effects of hibiscus tea consumption on BP among stage 1 or 2 hypertensive adults was conducted for a period of 6 months in Al-Rusafa health directorate. Patients are given 2 grams of Hibiscus sabdariffa dried herbs to use in 200 ml water that had to be boiled and left to cool off. All participants were given a leaflet of instructions on how to prepare the herbal tea. Compliance was ensured by asking each participant to record their tea intake daily using a small -note paper, patients were also called through the phone and followed up weekly. Chi-square test and Independent Student's t-test were applied to explore the significance of the difference between the interventional (study) group and the control group. Paired t-tests illustrated the significant difference between baseline and end of the study for systolic and diastolic blood pressure measurements. A P-value less or equal to 0.05 was considered significant. Results A total of 70 participants were enrolled in this study. Baseline SBP and DPB did not differ significantly (p-value =0.640) and (p value=1.000) respectively. At the end of the study, a significant difference in SBP and DBP (p-value 0.006) and (p value=0.007) respectively was seen indicating a successful intervention. There was a significant reduction in SBP in both groups (P < 0.001), and the mean reduction in SBP was significantly higher in the intervention group (-6.58 mmHg) compared to the control group (-1.71 mmHg) (P = 0.008). There was a significant reduction in DBP in both groups (P < 0.001), and the mean reduction in DBP was significantly higher in the intervention group (-5.00 mmHg) compared to the control group (-1.72 mmHg) (P = 0.005) Conclusions The study successfully showed a reduction in SBP and DBP. Hibiscus sabdariffa can lower blood pressure effectively.

Keywords: sour tea, hypertension, herbal, roselle

1. Introduction

Roselle, (Hibiscus sabdariffa) is a genus of the *Malvaceae* family, that is originated in Africa and was cultivated in India, Malaysia, Tropics, subtropics, and Central America. Egyptians use it as a drink known as kujarat extract or karkade, in Iraq it's the red tea while in Iran it's the "Sour Tea" [1]. Its red succulent flower petals, it contain about 15%-30% plant acids such as citrus, malic, tartaric acids, and alhydroxy citric acids lactones. The remaining percentage of the plant is comprised of many chemical compounds such as alkaloids, L-ascorbic corrosive, anthocyanin, Beta-carotene, Beta-sitosterol, citrus extract, polysaccharide rides Arabians and arabinogalactans, quercetin, gossypetin and little measures of galactose, arabinose, glucose, xylose, mannose, and rhamnose [2] and had been rumored to lower blood pressure.

Internationally, around 1.28 billion adults aged 30-79

years have hypertension. Most hypertensive individuals live in developing countries. According to WHO statistics only 21% of hypertensive control their blood pressure. [3] This condition is associated with a range of undesirable clinical outcomes including stroke, myocardial infarction, heart failure, renal insufficiency, peripheral vascular disease, and retinopathy. [4] A recent Iraqi study reported a hypertension prevalence of 54.7%. [5] Hypertension is no longer an exclusive disease of senior citizens; it distresses the life of adults between 20 to 40 years of age [6].

Herbal medicines are not controlled by supervisory health authorities and are often not of proven safety and efficacy yet their use is not uncommon [7], around 80% of the world's population, predominantly in developing countries, uses herbal medicines as they are readily available, need no prescription, are cheaper than drugs, have no or fewer side effects, and are used in doses presumed safe and natural by

consumers and sellers^[8]. If the potential mechanisms of these herbal medicines were deciphered and followed through a series of researches, it will help ensure efficacy and guarantee patients' safety to use. Thus, the current study aims to evaluate the effectiveness of sour tea (*Hibiscus sabdariffa*) in lowering blood pressure among Iraqi patients with hypertension.

2. Patients and methods

Study design and place: the study was a randomized, controlled clinical trial to study the effects of hibiscus tea consumption on BP among stage 1 or 2 hypertensive adults. The study was conducted in Al-Rusafa health directorate. Ten primary health care centers (PHC) were selected randomly. The study was conducted from the first of September 2021 and continued to the end of February 2022.

Inclusion Criteria: all patients 18 - 70 years with hypertension: stage one (SBP 130-139 or DBP 80-89) or stage two (SBP \geq 140 mm Hg or DBP \geq 90 mm Hg) who attended the PHCs and accept to participate in the study.

Exclusion criteria

Patients younger than 18 years, of age. Those with chronic diseases (Diabetes mellitus, renal failure, coronary artery disease, autoimmune diseases, cancer, etc.). Hypertensive Crisis. Hypertension due to secondary causes. Pregnant patients or breastfeeding. Taking psychiatric medication (mood stabilizers, antidepressants, anxiolytics, or antipsychotics). Those with a history of allergy to sour tea. Regular hibiscus users.

To determine eligibility, BP was ascertained during the interview using a standardized method and according to the American Heart Association, American College of Cardiology Guideline Recommendations by Blood Pressure Category [9]. Participants' SBP and DBP 130-139 or 80-89 considered stage one hypertension. Participants' SBP and DBP of 140 or higher or 90 or higher considered stage two hypertension. Both stages one and two qualify for study participation. Participants were excluded if their mean BP values were outside the specified range

In total, 92 patients were recruited for the study initially. 13 were excluded and 79 participants were randomized using a simple random method into the interventional (study) group and control group. All participants were told about the study purpose and signed written consent was obtained from all participants. Figure (1) demonstrate the action plan in details.

Patients' age, gender, marital status, phone numbers, employment, educational attainment, BMI, smoking habits, and anti-hypertensive drugs used were all documented, and pre and post-interventional blood pressure were recorded.

All participants were followed for a period of 30 days when another session for blood pressure

measurement was scheduled; those lost to follow-up were not included in the final analysis. The loss of follow-up was not for medical causes (mainly due to a busy schedule) Patients are given 2 grams of *Hibiscus sabdariffa* dried herbs to use in 200 ml water that had to be boiled and left to cool off. All participants were given a leaflet of instructions on how to prepare the herbal tea. Compliance was ensured by asking each participant to record their tea intake daily using a small -note paper, patients were also called through the phone and followed up weekly

Blood pressure measurement: A consistent protocol was trailed for each BP measurement by using the suitable cuff size for each participant and applying it to the same arm. Study participants are instructed to sit comfortably in a quiet environment, with feet on the floor, for 10 min, after which BP was measured with the arm at heart level. The BP measurement was then repeated every 5 min for the next 15 min. Values for these 3 determinations of SBP, DBP were averaged.

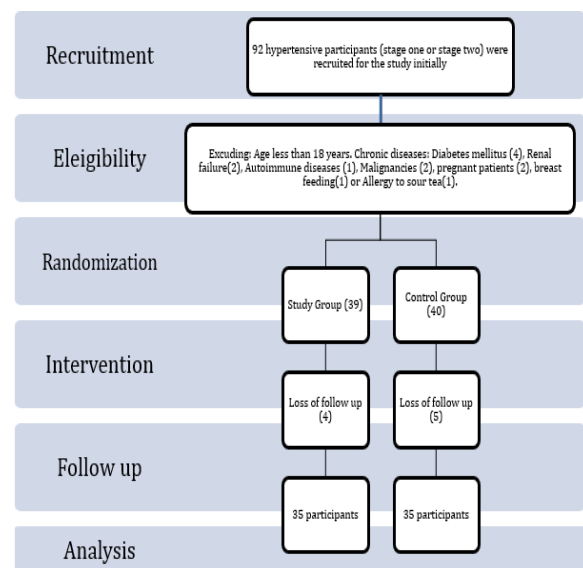


Figure (1) The action plan

Statistical analyses. Statistical analyses were performed using SPSS version 20.0. Data were coded and entered in the SPSS sheet. Chi square test and Independent Student's t-test were applied to explore the significance of difference between the interventional (study) group and the control group. Independent Student's t-test was also used to determine if there is a significant difference in systolic and diastolic blood pressure between the two groups at an endpoint (baseline and end of study measurements), while paired t-tests illustrated the significant difference between baseline (pre-test) and end of study (post-test) for systolic and diastolic blood pressure measurements. A P-value less or equal to 0.05 was considered significant.

3. Results

A total of 70 participants were enrolled in this study. Table (1) demonstrates no significant difference between the studied groups.

Table (1) Demographical features of the studied groups

Variables		Control group N=35	Study group N=35	P-value*
Age In years (M±SD)		49.34±9.28	52.40±10.05	0.191**
BMI in kg/m ² (M±SD)		28.81±2.74	29.87±3.72	0.179 **
Gender	Male	15(42.9%)	22(62.9%)	0.150
	Female	20(57.1%)	13(37.1%)	
Marital status	Single	4(11.4%)	2(5.7%)	0.673
	Married	31(88.6%)	33(94.3%)	
Employment status	Employed	15(42.9%)	22(62.9%)	0.150
	Unemployed	20(57.1%)	13(37.1%)	
Educational attainment	Illiterate /read and write	8(22.9%)	5(14.3%)	0.341
	Primary graduates	9(25.7%)	6(17.1%)	
	Secondary or higher	18(51.4%)	24(68.6%)	
Smoking	Current smoker	7(20.0%)	7(20.0%)	0.664
	Ex-smoker	6(17.1%)	9(25.7%)	
	Non-smoker	22(62.9%)	19(54.3%)	

*Chi-square test; ** independent sample t-test

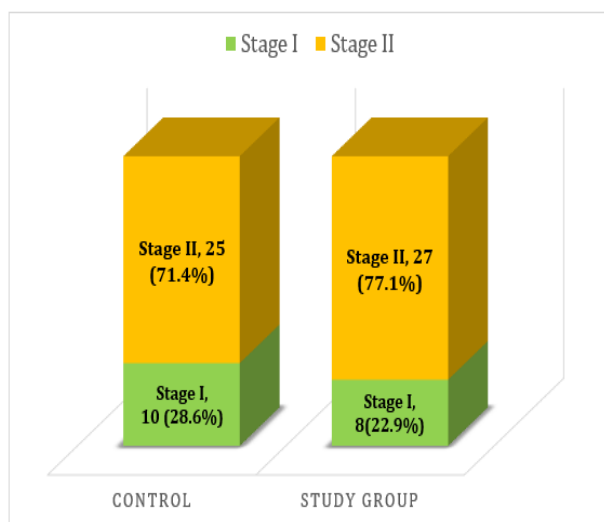


Figure (2) Distribution of the studied sample according to the stage of hypertension

Three-quarters of the studied sample was classified as stage two hypertensive. Figure (2) shows no

significant difference between the interventional and the control group in hypertension staging (p value=0.785)

The groups were matched by their use of antihypertensive drugs, 34 (48.6%) of the studied sample used antihypertensive drugs (17 in each group) and 36 (51.4%) of patients (18 patients in each group) didn't use hypertensive treatments.

Baseline systolic (SBP) and baseline diastolic (DPB) did not differ significantly between the two groups (p-value =0.640) and (p value=1.000) respectively. As seen in table (2). There was a significant reduction in blood pressure over time suggesting a successful intervention.

At the end of the study, there was a significant difference in SBP and DBP between the two groups (p-value 0.006) and (p value=0.007) for systolic and diastolic blood pressures respectively. Indicating a successful intervention.

Table (2) Comparison of systolic and diastolic blood pressure between the study groups at baseline and end of the study

variables	Control group			
	Baseline	End of study	Mean difference	Baseline vs End of study ‡
SBP	140.57±6.50	138.86±5.95	-1.71	0.008
DBP	88.43±4.16	86.71 ±3.62	-1.72	0.005
variables	Study group			
	Baseline	End of study	Mean difference	Baseline vs End of study ‡
SBP	141.29±6.22	134.71±6.29	-6.58	0.000
DBP	88.43±4.66	83.43±5.91	-5.00	0.000
Baseline vs Baseline*				
			SBP	0.640
			DBP	1.000
End of study vs End of study*				
			SBP	0.006
			DBP	0.007

* Independent t-test
‡ paired t-test

There was a significant reduction in systolic blood pressure in both groups (P < 0.001), and the mean reduction in systolic blood pressure was significantly

higher in the intervention group (-6.58 mmHg) compared to the control group (-1.71 mmHg) (P = 0.008) as seen in figure (3)

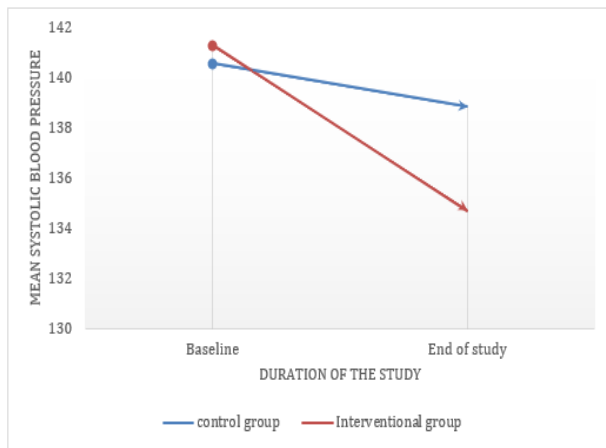


Figure (3) Changes in systolic blood pressure among intervention and control groups during the study

There was a significant reduction in diastolic blood pressure in both groups ($P < 0.001$), and the mean reduction in diastolic blood pressure was significantly higher in the intervention group (-5.00 mmHg) compared to the control group (-1.72 mmHg) ($P = 0.005$) as seen in figure (4)

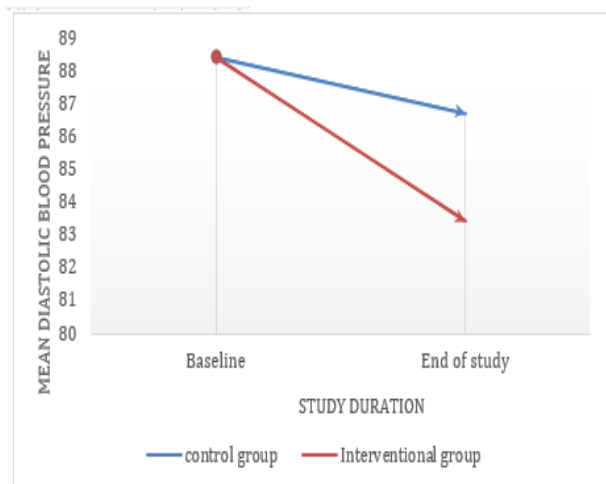


Figure (4) Changes in diastolic blood pressure among intervention and control groups during the study

4. Discussion

Due to the change in lifestyle toward more sedentary behaviors with the advanced technologies, obesity pandemic, smoking, a shift in diets and nutritional habits, consumption of processed foods, and even outbreaks, it is only sensible to expect a continuous rise in high blood pressure prevalence [10,11].

Hypertension is a serious problem, and if not under control it adds a load on the health system as it demands the need for overpriced interventions to be solved and managed including cardiac bypass surgery, carotid artery surgery, and dialysis, draining individual and government budgets. Finding an easy-to-make, readily available, cheap supportive, or alternative method of lowering blood pressure, is a fair practice, especially in developing countries with large masses of people who can't afford treatment or measurement [11].

H. sabdariffa is readily available and with wide

acceptance as herbal traditional tea. The current study illustrated a successful reduction in systolic and diastolic blood pressure with the use of red tea, which is in alignment with previously published literature by Al-Shafei A and El-Gendy O from Saudi Arabia [12]. And by Jalalyazdi M et al where the authors described a significant reduction in systolic blood pressure in both groups and the average decrease in SBP and DBP was significantly higher in the case group ($P = 0.004$ and $P < 0.001$, respectively) [13]. The current result is also in agreement with a published article by Nwachukwu DC et al [14], who concluded that the efficacy of *H. sabdariffa* is similar to lisinopril and even more effective than hydrochlorothiazide [15]. *H. sabdariffa* lowers blood pressure and hyperlipidemia. Its effects were facilitated through the elevated production of NO, blocking of Ca^{2+} channels, and opening of KATP channels (ATP-sensitive potassium channels). Roselle partakes diuretic effects, exhibits potent antioxidant function, and prevents the oxidation of low-density lipoprotein. Furthermore, it displays anti-inflammatory abilities through the inhibition of angiotensin-converting enzyme activity and proliferation of vascular smooth muscle cells [8, 16,17]. In one systematic review and meta-analysis study discovered that sour tea consumption could have a beneficial effect in controlling glycemic status and blood pressure among adult population. [18]

In concordance with our current results the reduction in SBP was -6.58 mmHg and in DBP -5.00 mmHg among the intervention (study) group. This is aligned with Abdelmonem M et al meta-analysis in 2022 and reported that *Hibiscus sabdariffa* significantly reduced both SBP and DBP (mean difference -6.67- and -4.35-mm Hg) respectively [19]. It's also comparable to the printed outcome of a systemic review by Serban C et al which showed [20] reduced SBP and DBP (mean difference -7.58, and -3.53 mm Hg) significantly. While a previously published clinical trial by Herrera-Arellano A et al [17] demonstrated a decrease in SBP from 139.05 to 123.73mmHg and DBP from 90.81 to 79.52mmHg. That is to say around 16 and 11 mmHg reduction was seen. This difference in the decrease might be related to the dose of *H. sabdariffa* used, in our study, we standardized the dose to only 2 grams per day for 1 month of follow-up, while the mentioned trial went on using 10 g of dry calyx from *H. sabdariffa* on 0.51 water daily for 4 weeks. This can highlight a possibility of dose-related effect exhibited by *H. sabdariffa* and suggest a novel area for researching the antihypertensive effect of *H. sabdariffa*. Although those natural plants can be used as remedies yet their effect must be confirmed and researched [8] and probably even incorporated as an early line of management.

5. Conclusions

The study successfully showed a reduction in SBP and DBP among the study group, *Hibiscus sabdariffa* can lower blood pressure effectively

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