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Research Article

Effect of *Sabdariffa (Zobo)* and *Hyphaene Thebaica* (Goriba) on Blood Pressure among Hypertensive Patients at Murtala Muhammad Special Hospital Kano-North-Western Nigeria: An Open Label Orthodox -Drug Controlled Randomized Trial

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ABSTRACT

Ethnopharmacologically, *Hibiscus sabdariffa* (HS) and *Hyphaene Thebaica have* been used as a folk remedy for the treatment of hypertension. Moreover, several in vitro and in vivo ethnobotanical studies demonstrated such evidences. This study investigated the antihypertensive effect of an aqueous extract of *Hibiscus sabdariffa* and *Hyphaene Thebaica* on blood pressure reduction. An open label orthodox-drug Controlled Randomize Trial was conducted where 30 hypertensive patients were recruited and randomized into the experimental and control groups. Participants in the experimental group were subjected to 3.75g/240ml of the products as add- on to their antihypertensive drugs while the control group continued with their routine antihypertensive drugs only without add- on. Both groups were followed and monitored one week apart for possible blood pressure reduction across 4weeks periods. At 4 weeks, *Sabdariffa and Hyphaene Thebaica* tea was found to have lowered systolic blood pressure (SBP) by 14.4mmHg and diastolic blood pressure (DBP) by 8.5mmHg on the intervention group; P <0.05, CI,95%). The findings showed that daily consumption of a tea or extract produced from Hibiscus *sabdariffa and Hyphaene Thebaica calyxes* significantly lowered systolic blood pressure (SBP) by 14.4mmHg and diastolic blood pressure (DBP) by 8.5mmHg among the studied group. These results suggest daily consumption of Hyphaene *Thebaica* and *Hibiscus sabdariffa* tea as add-on to orthodox drugs, in an amount readily incorporated into the diet, lowers blood pressure in hypertensive adults and may prove an effective component of the dietary changes recommended for people with high blood pressure. However, further in vivo, and in vitro studies are required to validate the clinical efficacy of *Hyphaene Thebaica* and *Hibiscus sabdariffa* in large-scale study.

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1.0 INTRODUCTION

High blood pressure is a global health problem with significant magnitude of morbidity and mortality (Ojeda et al.,2010). Hypertension is a major risk factor for cardiovascular disease and is associated with substantial morbidity and mortality, estimated to account for 13.2% of myocardial infarction and stroke, 24.6% (Adedayo et al.,2024).Observational studies show that diets high in plant foods are associated with a lower risk of chronic diseases, such as cardiovascular disease and some forms of cancer (McKay et al. , 2010).) . The health benefits of plant foods appear not to be simply attributable to their macro- and/or micronutrient content alone but also to the presence of phytochemicals (Tseng et al.,1997). Many polyphenols, particularly the flavonoids, possess relatively potent antioxidant, anti-atherosclerotic, anti-inflammatory, antimutagenic, antitumor, and antiviral activities. More so, further research is necessary to elucidate and quantify the contributions of phytochemicals to health promotion and disease prevention, virtually all dietary guidelines created by regulatory agencies and healthcare organizations include recommendations for generous intakes of plant foods, including fruits, vegetables, and wholegrain cereals (Sakhawot et al.,2025). (Herrera-Arellano et al.,2007, Haji Faraji& Haji Tarkhani 1999) reported that High blood pressure is a very common disease and is considered "the silent killer". Hypertension is responsible for at least 45% of deaths due to heart disease, and 51% of deaths due to stroke (Appel et al., 1997). Hypertension plays a part in the pathology of heart disease, stroke,kidney failure and premature mortality and disability. If hypertension goes uncontrolled, in the long term, it will cause serious complications, most of which will necessitate costly interventions (Ojeda et al.,2010).As the world has become a global village, people are now, more than ever, well enlightened and very cautious in the use of pharmacological drugs in the management of various diseases. This has resulted in an emerging use of herbal medicine as an alternative to chemical medicine (Dalhatu et al.,2023. *Hibiscus*is is a genus of flowering plants in the mallow family, Malvaceae. It is quite large, containing several hundred species that are native to warm-temperate, subtropical and tropical regions throughout the world. *Hibiscus Sabdariffa* (HS) known as Roselle or Red Sorrel in English-speaking countries and 'Zoborodo', also known as 'zobo' in Hausa, is a tropical plant widely grown in Central and West Africa, South-East Asia and elsewhere. Common names besides Roselle are Red Sorrel, Karkade, Zobo, sour tea and red tea[5].*Hibiscus Sabdariffa* is traditionally used for variety of purposes such as: wound dressing, bronchitis and diabetes, cardiac and neurologic diseases, repair of calcified vessel; it also has an antispasmodic, hypocholesterolemia, antibacterial, antifungal, anticancer, muscle relaxant effects and recently, it is used as antihypertensive agent. Recent studies show that *Hibiscus Sabdariffa*can lower blood pressure as effectively as some standard anti-hypertensive drugs (Adengunloye et al.,1996). The extract of this plant exerts the antihypertensive activity by at least three major specific mechanisms of action: diuretic, vasodilator and angiotensin converting enzyme inhibitor (ACE inhibitor) effect. *Hibiscus Sabdariffa* act as diuretic by inhibition of sodium (Na+) and water re-absorption (Javier et al.,2012). It has an advantage over the loop diuretic furosemide as it does not cause over-reactivation of the renin-angiotensin-aldosterone system and in addition, it can maintain the potassium concentration in the body (Ali et al.,1991, Ogunloye et al.,1996).

MATERIALS AND METHODS

Study Design: the study employed an open label orthodox -drug control trial after having registering the study into Pan Africa Trials.Org. with reference number: PACTR202312830900344. An open label orthodox drug randomized, -controlled clinical trial was conducted to study the effects of *Hibiscus Sabdariffa and Hyphaene Thebaica* tea consumption on blood pressure among adults' patients with essential hypertension. All participants followed their usual diet throughout the intervention. Participants were randomized

according to a computer-generated randomization list and stratified by gender and age. Study personnel and participants were aware of which beverage was being tested and of treatment assignment for the duration of the intervention. They were told the study purpose was to examine the effects of a Hibiscus *and Thebaica* beverage and the word "tea" was used in all advertising, instructional, and consent documents.

Study setting: The study was conducted at Murtala Muhammad Specialist Hospital Kano. Patients with grade I (140-159/90-99mHg) and II (160/100mmHg) hypertension base on World Health Organization Classification were recruited from the cardiac clinic of the hospital

Ethical approval: ethical approval was sought and granted by Health Research Ethics Committee of Kano State Ministry of Health with reference number: HREC/17/03/2018. The state ministry of health provided the ethical approval in 2023 but with the reference number of NHREC/17/03/2018

Participant eligibility

Thirty non-smoking men and women, age 25–70 years, with systolic BP (SBP) > 130 mm Hg, diastolic BP (DBP) >90 mm Hg, and BMI of 18.5–35 kg/m2 were recruited from the cardiac clinic of Murtala Muhammad Specialist Hospital Kano. To determine eligibility, BP was ascertained during 2 separate baseline visits, 1 week apart, using a standardized method.

Participants' mean SBP and DBP had to be within the specified range on both baseline visits to qualify for study participation. Participants were excluded if their mean BP values were outside the specified range; or if they had cardiovascular, renal, endocrine, or gastrointestinal disease, rheumatoid arthritis, or pregnancy within the previous 6-month, illicit drug use; EKG; or standard clinical laboratory values outside acceptable ranges. A purposive sampling method was employed to recruit thirty (30) hypertensive patients from cardiac clinic for both experimental and control groups i.e fifteen (15) experimental and fifteen (15) controlled. The experimental group were subjected to 3.75g/240ml of the products (*Hibiscus sabdariffa* and *Hyphaene Thebaica*) in form of tea as add- on to their conventional antihypertensive drugs while the control group were subjected only to their conventional antihypertensive drugs. Blood pressure of the patients was consecutively monitored and measured across four (4) separate visits, one week apart. Based line data, blood profile/ chemistry was evaluated and compared withthe final results. The obtained data were analyzed using T-test and presented in tables.

Test beverages

Participants were given prepared sachet of *Sabdoriffa* and *Thebaica*. Each serving of hibiscus and Thebaica tea was prepared by brewing 1 bag (containing 1.25 g *H. sabdariffa/ H Thebaica*) per 240 mL boiled water for 6 min, then removing the bag. The final concentration of the constituents was sieved, filtered and prepared at 3.75g/240ml. This amount of hibiscus is present in a variety of commercial, blended herbal teas. Each serving of the control group was only placed on routine orthodox antihypertensive drugs.

Intervention

Qualified participants refers to patients who met the inclusion criteria from the experimental group received 3.75g/240ml of *H.Sabdariffa* and *H.Thebaica* tea as add- on to their routine antihypertensive drugs while the control group were treated only with their conventional antihypertensive drugs at their second baseline visit and returned once each week for the next 4 weeks for subsequent data collection and reassessment. During each weekly visit, participants reported to the cardiac clinic of the hospital to determine the effects of drinking Sabdariffa and H.*Thebaica* tea, each participant's blood pressure was measured during the morning of their study visits.

RESULTS

The study was conducted among thirty (30) mildly hypertensive patients-based WHO criteria. Fifteen (15) hypertensive patients received 3 .75g/240ml of H.Sabdariffa and *H.Thebaica* as add-on drugs to their routine antihypertensive drugs for intervention group while fifteen (15) hypertensive patients were maintained on the routine antihypertensive drugs without add-on.

Table 1. Socio-demographic characteristics of the respondents

Socio-demographic data n=30		Frequency	Percentage %
Respondents	Experimental group	15	50.0
	Control group	15	50.0
Age (Years)	Mean. 58.58 ± 13.504		
Gender	Male	12	40.0
	Female	18	60.0
Educational level	Primary	4	13.3
	Islamic	13	43.3
	Secondary	5	16.7
	Higher	8	26.7
Marital status	Single	0	0.0
	Married	26	86.7
	Divorced	0	0.0
	Widowed	4	13.3
Ethnicity	Hausa/Fulani	26	86.7
	Igbo	2	6.7
	Yoruba	0	0.0
	Others	1	3.3
	Not stated	1	3.3
Residence	Urban	21	70.0
	Sub-urban	2	6.7
	Rural	7	23.3
Duration of hypertension	<1 year	3	10.0
	1-5 years	15	50.0
	6-10 years	2	6.7
	>10years	10	33.3
Family history of high blood pressure	Yes	14	46.7
	No	14	46.7
	Not sure	2	6.7

It is shown that most patients are above 40 years of age, and reflected higher number of females (60%) compared to males' counterpart (40%) with majority of them having high blood pressure between 1 to 5 years.

Figure.1. Experimental Group (n=15 patients were followed across the study period). The patients received 3

.75g/240ml of H. Sabdariffa and H. Thebaica as add-on drugs

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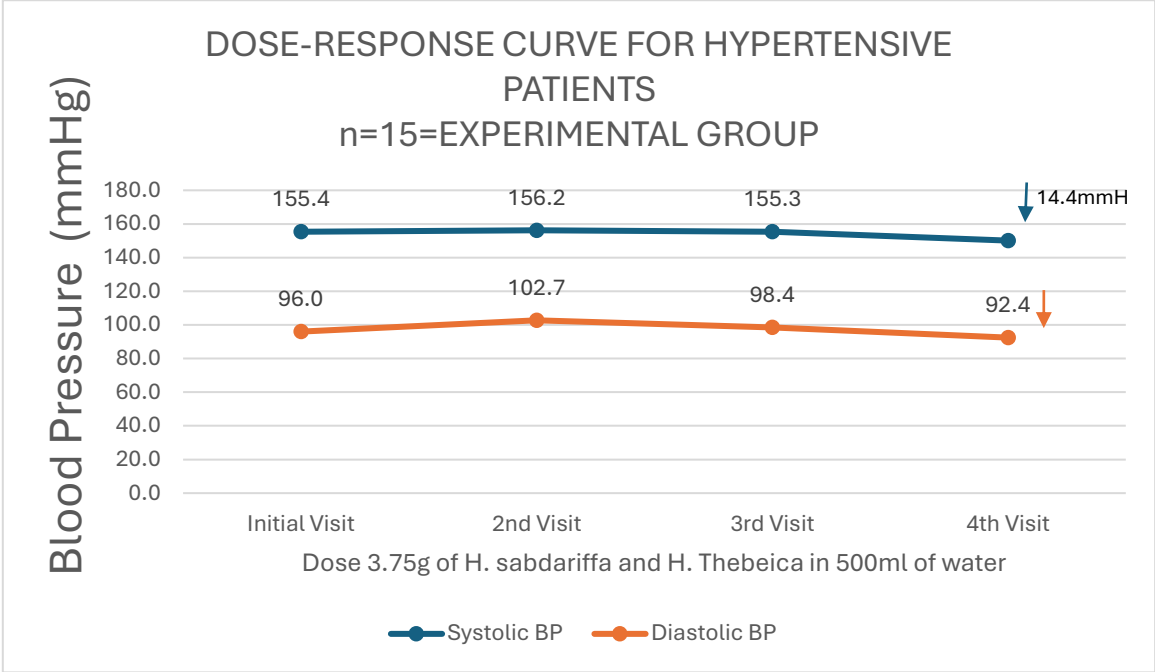


Figure 2: Control Group. these patients were not treated with 3 .75g/240ml of H.Sabdariffa and H. Thebaica as add-on drugs but maintained on the routine antihypertensive drugs

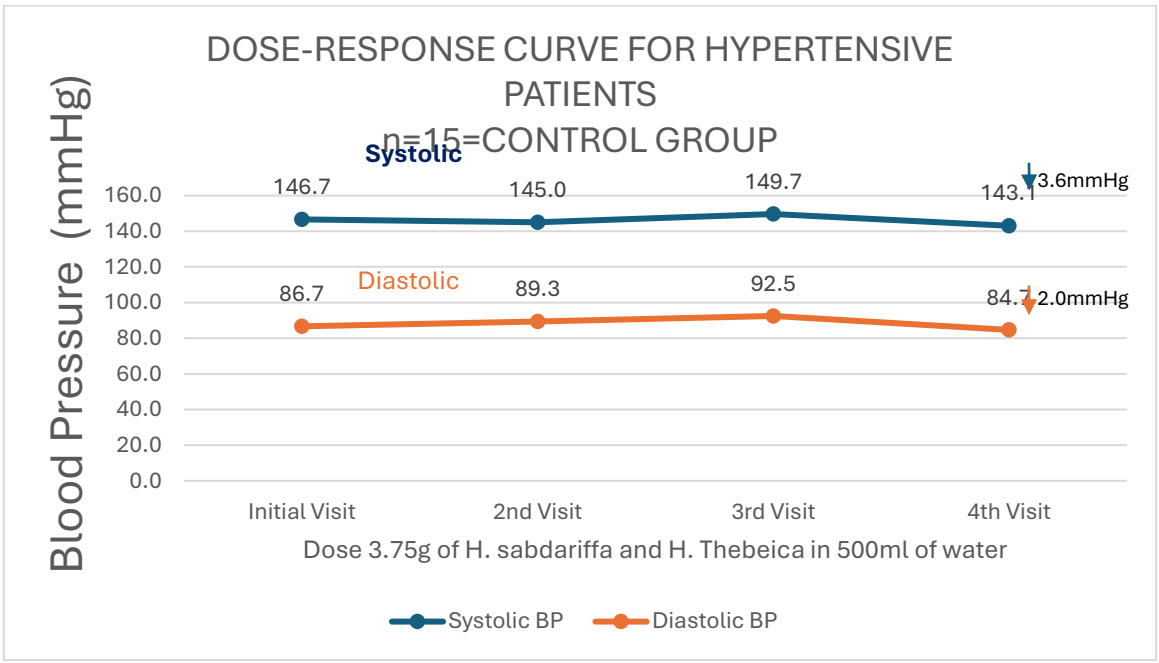


Figure 3: Systolic Blood Pressure changes for Experimental Group VS Control Group n=30

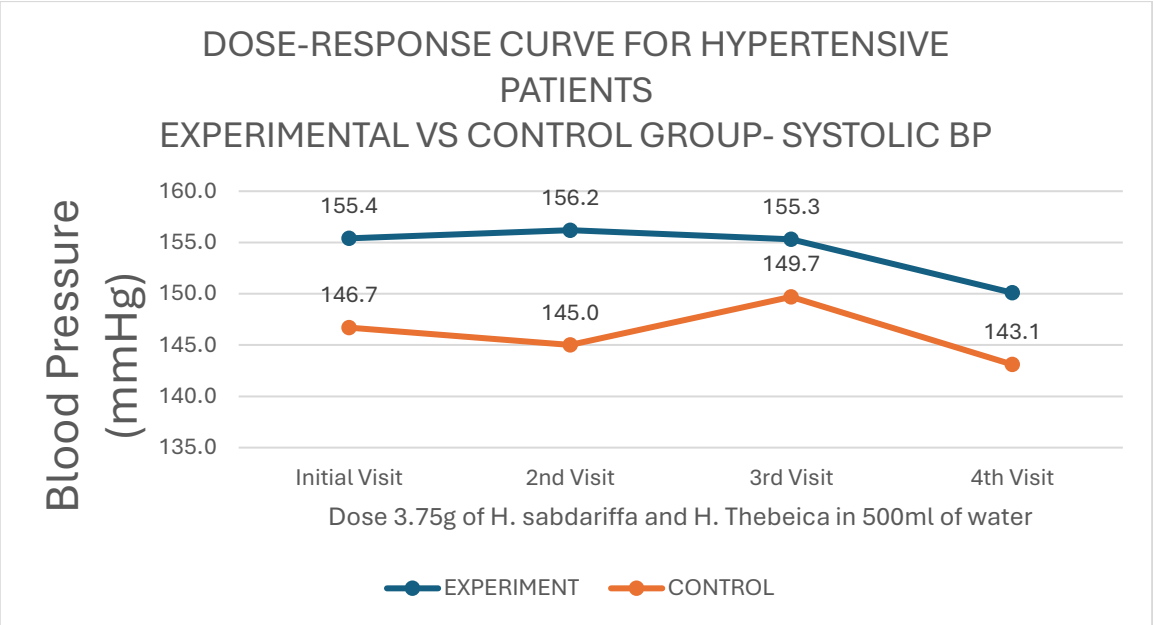


Figure 4: Diastolic Blood Pressure changes for Experimental VS Control Group

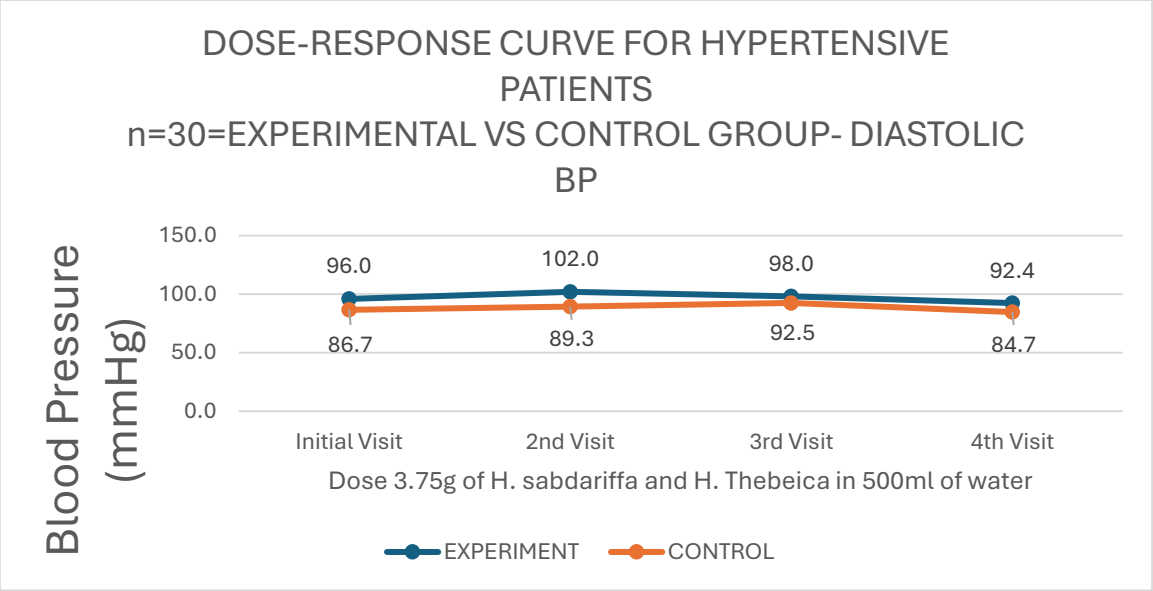


Table 2: T-test on Blood Pressure changes in hypertensive patients following a 4-weeks intervention with Orthodox drugs plus tea add- on

Group	Blood Pressure Parameter	Baseline Mean (mmHg)	SE	t Value	p Value	df
Group A: Orthodox antihypertensive drugs	SBP	148.0	1.1	2.95	0.132	0.77
	DBP	86.0	2.0			
Group B: Orthodox drugs + *H. thebaica* and Hibiscus tea	SBP	146.7	2.2	3.8	0.075	
	DBP	86.7	5.5			1.075

Independents T-samples t-test showed a slight difference in blood pressure score between the groups. Participants in Group A scored slightly higher in systolic blood pressure than Group B

Table 3: Blood Pressure Parameters After 4 Weeks of Orthodox Antihypertensive Drug Treatment, n = 15

Blood Pressure Parameter	Baseline (mmHg)	After 4 Weeks (mmHg)	Change from Baseline (mmHg)
Systolic blood pressure, SBP	148	146 ± 1.1	2.0 ± 1.1
Diastolic blood pressure, DBP	86	86 ± 1.4	1.0 ± 0.0

It is clear from the table above that there is a slight change in systolic blood pressure SBP reducing by 2.0mmHg after 4 weeks of taken orthodox drugs, $P<0.05$

Table 4. Blood Pressure Parameters After 4 Weeks of Orthodox Antihypertensive Drug Treatment, n = 15

Blood Pressure Parameter	Baseline (mmHg)	After 4 Weeks (mmHg)	Change from Baseline (mmHg)
Systolic blood pressure, SBP	148	146 ± 1.1	2.0 ± 1.1
Diastolic blood pressure, DBP	86	86 ± 1.4	1.0 ± 0.0

It is clear from the table above that there is a relative reduction in systolic blood pressure SBP by 3.6mmHg, and DBP by 2.0mmHg after 4 weeks of taken orthodox drugs plus add-on, $P<0.05$

DISCUSSION

The study shows that most patients were greater than 40 years of age and are majorly Hausa-Fulani by tribe. More so, most of the patients had longer duration of high blood pressure of between 1 to 5 years. These demographic dynamics were not previously reported, however, similar demographic characteristic with respect to age were reported among patients with mild to moderate hypertension (Jalalyazidi et al.,2019, Welz et al.,2018). The differences in the demographic dynamics could be linked to geographical locations and World Health Organization criteria employed in patients' selection. The presence study revealed that daily consumption of servings of H. sabdariffa (hibiscus) & H. Thebaica tea,an amount readily incorporated into the diet, effectively lowered blood pressure in hypertensive adults. Similar findings were reported among pre- and mildly hypertensive patients on H. sabdariffa (Herrera-Arrelano et al.,2004). The possible explanation to this effect could be associated with the presence of vitamin C, sodium, potassium, calcium, magnesium, and other dietary factors known to have an effect on blood pressure treatment groups during the intervention and, thus, were responsible for the observed change in blood pressure. Paired T-test analysis indicated that theH.Thebaica& hibiscus tea treatment was responsible for the blood pressure -lowering effect regardless of age, gender, or dietary supplement use. Interestingly, this is the first reported H.*Thebaica& H. Sabdariifa* clinical trial, conducted across the world to our knowledge, to examine the effect of *H.Thebaica& H. Sabdariffa* tea on blood pressure. Previous studies conducted in hypertensive patients used a higher dose of H. sabdariffa to compare its effectswith that of either black tea (Pradhan et al.,2019) or a hypotensive drug[5]. Haji

Faraji and Haji Tarkhani tested 54 patients, mean age 52 years, in a hospital-based, randomized, clinical trial over a 15-day period. In their study, the treatment group consumed 1 glass daily of H. sabdariffa tea prepared with 2 spoonfuls of blended tea per glass brewed in boiling water for 20–30 min. However, in this presence study *H. Sabdariffa &H. Thebaica* tea was used for the treatment group in a daily dose of 3.73g/240mL over a month period. Other previous studies reported the effect of black tea in control group, but it is worth noting that black tea is not an inert placebo because it contains caffeine, catechins, and flavonols, compounds known to affect vasodilation (Chen et al.,2003), compared H. sabdariffa with an angiotensin converting enzyme (ACE) inhibitor in a randomized trial of 75 patients aged 30–80 years. In their study, an infusion prepared with 10 g of dry calyces from *H. sabdariffa* in 0.5L water (9.6 mg anthocyanins) and administered daily was compared with 25 mg captopril administered twice daily for 4wk and SBP did not differ between the groups. But interestingly, our study compared the effects of both *H. Sabdariffa and H. Thebaica* against antihypertensive drugs consumed by patients and a significant reduction in both systolic and diastolic blood pressure was observed. The magnitude of change in systolic blood pressure from baseline in both the Haji Faraji and Haji Tarkhani and Herrera-Arellano et al. studies was approximately higher than the amount observed in this presence study. This outcome was not unexpected, because the participants in these their studies had higher initial systolic and diastolic blood pressure than our participants and were taking antihypertensive medication prior to the intervention. Only, that in our study we combined both *H. Thebaica & H. Sabdariffa* as add on medication to their routine antihypertensive drugs. The blood pressure lowering effects of H. *Thebaica & H. Sabdariffa* tea observed in our study were greater than those reported in 2 large dietary interventions, the Dietary Approaches to Stop Hypertension (DASH). The observed blood pressure lowering effect of H. *Sabdariffa & H. Thebaica* tea could be due to its major flavonoid components, delphinidin-3-sambubioside and cyanidin-3-sambubioside. However, other phytochemicals present might also contribute to this effect (Hartog et al.,1993, Mozaffari-Khogradi et al. ,2009). Herraro-Arellano *et al*. demonstrated the blood pressure lowering effects of a standardized H. sabdariffa extract containing 250 mg of these anthocyanins in a 4-weeks study of 171 hypertensive patients. The extract lowered blood pressure
from baseline after 4 weeks although the magnitude of this effect was lower than that achieved in the comparison group treated with 10 mg lisinopril. In the presence study the blood pressure lowering effect of *H. Thebaica & H. Sabdariffa* is higher compared to previous studies. The possible explanation to these differences could be linked to the fact that most studies examined the effect of hibiscus tea only on hypertensive patients while our study examined the combine effect of both hibiscus and thebaica tea extracts on hypertensive patients. The augmented blood pressure change or effect reported in this study could be hypothesized due to higher concentration of Flavanoid, Glycoside, reducing sugar, Saponin, Tannin, Resin and Phenolic pytochemicals contain in H. Thebaica which could possibly enhanced endothelial relaxation which in turn lowers peripheral resistance thereby reducing blood pressure

The potential mechanisms of action for the blood pressure -lowering effect of H. sabdariffa & *H. Thebaica* were not determined in our study but have been explored by others on H. sabdariffa. In vitro and animal studies show thatH. sabdariffa is a vasorelaxant (Ojeda et al., 2010), perhaps via action on calcium channels, an ACE inhibitor, and a diuretic. The ACE inhibitor activity and natriuretic effects of H. sabdariffa have also been observed in human studies (Ojeda et al.,

2010). Other potential mechanisms of action related to the effects of the anthocyanins present in H. sabdariffa are also possible (Welz et al., 2018). Previous studies indicate the consumption of polyphenol-rich foods may induce beneficial changes in pathways related to cardiovascular health. Animal models and a limited number of human studies have shown beneficial changes in measures related to cardiovascular health following the consumption of polyphenols, including increases in endothelial function and inhibition of platelet aggregation (Pradhan et al.,2001). The specific attributes of H. sabdariffa to cardiovascular health, including its ability to lower BP and its potential hypocholesterolemia effects, are not well understood and further research in this area is needed.

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