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Research Article

A Comparitive Study on the Effect of Ginger Tea and Hibiscus Tea on Hypertension

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Abstract

Aim: To prepare Ginger & Hibiscus Tea powder & study their effect in reducing the systolic and diastolic blood pressure in hypertensive individual. To compare the results and conclude which among the two is more effective.

Methodology: Ginger & Hibiscus tea powder were produced by drying fresh ginger and Hibiscus leaves .A non-blinded randomized interventional study with randomized two study groups with n=50 in each and one control group n=50. One of the two intervention group received 1 serving of Ginger tea & the other intervention group received 1 serving of Hibiscus tea once daily for the study period of 8 weeks. Data was collected using Anthropometric measurement, Questionnaire and SBP and DBP measures.

Results: Results showed a positive effect of these in lowering SBP and DBP levels when consumed daily. This result can be supported by comparing the results of intervention groups to the control group. The intervention groups showed a decrease in both SBP and DBP while there was an increase in SBP and DBP levels in the control groups. It was seen that Ginger tea has a better hypertensive effect than Hibiscus tea. Overall the Ginger tea group showed a decrease of 9.3mmHg while the Hibiscus group have a decrease of 6.7mmHg in SBP, while for DBP Ginger tea group showed a decrease of 3.8 mmHg and the black seed group showed a decrease of 3.1mmHg.

Conclusion: It can be concluded that both Hibiscus tea and Ginger tea have a good antihypertensive effect and can be incorporated as an effective measure in the dietary regimen of Hypertensive individuals which can be backed by the statistically significant results that were obtained by this study.

Keywords: Hypertension, Non-communicable diseases, Cardiovascular disease risk, Systolic blood pressure, Diastolic blood pressure, Hibiscus sabdariffa, Ginger, intervention, etc.

INTRODUCTION

The World Health Organization (WHO, 2013) states that hypertension is a chronic condition characterized by a continuous increase in the pressure of blood flowing through blood vessels, making it difficult for the heart to pump blood into the circulatory system. Is defined as. Hypertension is diagnosed when Systolic Blood Pressure (SBP) is 130 mmHg or higher, Diastolic Blood Pressure (DBP) is 80 mmHg or higher, and meets the guidelines of the American Heart Association (AHA) Abubakar et al., (2019).

Ginger has been found to possess antihypertensive effects through its components 6-shogaol and 9-gingerol. It seems that these inhibit the formation of sticky plaque along the walls of blood vessels and increase the elasticity of the

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arteries through the reduction of LDL and total cholesterol levels Aburto et al., (2013).

Hibiscus(HS) also called roselle, is a perfect crop for developing countries because it is comparitively easy to grow,it is grown as a part of multicropping systems and might be used as food and fibre. Traditionally, medicines and herbs have been used to control high blood pressure, such as decoctions of olive leaves, garlic (Harenberg, 1978), and especially sour tea (Hibiscus sabdariffa) Adegunloye et al., (1996). They are known from folk remedies and common belief that they have a beneficial therapeutic effect and minimal side effects Ajay et al., (2009).

Anthocyanins, particularly delphinidin-3-sambubioside and cyanidin-3-sambubioside, are generally considered active compounds that cause the antihypertensive, antioxidant and cholesterol-lowering effects of HS, possibly because they are found in relatively high amounts in aqueous extracts Alfillaturrohman & Wibowo (2020).

METHODOLOGY

The study was undertaken to examine and compare the effect of Hibiscus sabdariffa tea and Ginger tea on blood pressure in hypertensive patients after six weeks of the intervention period Aliyu et al., (2014).

Objectives

- To Prepare Ginger tea powder and Hibiscus tea powder.
- To carry out the nutrient analysis of the developed products.
- To assess the shelf life of the developed products.
- To study the effect of Ginger & Hibiscus tea on the Blood pressure levels.
- To compare the effect of Ginger & Hibiscus Tea on hypertensive patients after a
- Period of 60 days of consumption.

Research design: A non-blinded randomized clinical trial was held to achieve the aim of the study Alizadeh-Navaei et al., (2008).

Sample size: A convenience sample of 150, middle-aged hypertensive patients was undertaken. They were divided alternatively into three equal groups; 50 patients in each group Aljuraiban et al., (2015).

Inclusion criteria

- Aged between 30 to 65 years.
- No gender bias (both male and female).
- Patients diagnosed as hypertensive with Blood pressure levels > 120 /80 mmHg.

Exclusion criteria

- Patients have a history of (gallstones, heartburn, stomatitis, hypoglycemia, heart diseases).
- Patients have bleeding disorder or taking blood-thinning medications, including aspirin,
- Warfarin.
- Pregnant or Brest feeding women

PREPARATION OF GINGER TEA POWDER & HIBISCUS TEA POWDER AT HOME

Nutrient analysis & shelf-life study: The developed products -Hibiscus tea powder and Ginger tea powder were sent to Equinox lab located in Mumbai for nutrient & shelf life analysis. Nutrients were analyzed using standard methods. For the analysis, 200 gm of sample was packed in a plastic air tight

box and sent to the lab Armstrong et al., (1979).

INTERVENTION

Participant information: 166 Hypertensive patients from Hyderabad City were assessed for eligibility into the study. Their Name and Anthropometric data were collected which include their height, weight and following this a brief medical history was collected by questioning them. Out of the 166 participants assessed, only 150 (54 males, 78 females) met all the inclusion criteria and were recruited into the study.

Data collection: Data collection was done via questionnaires, anthropometric and blood pressure measurement. A baseline collection was done while recruiting the participants, next set of data collection was done during the follow up i.e. after every 15days. Collection of data began from the 1st week week of March 2022 and was completed by the 1st week of May 2022 Baek et al., (2004).

Ethical consent: A written consent was taken from all the participants before intervention Chen et al., (2009).

Study design & procedure: The study is a non-blinded Randomized Controlled Clinical Trial (RCT), to study the effects of hibiscus tea consumption on BP among hypertensive adults. All participants followed their usual diet throughout the intervention. Subjects were randomized into 3 groups:

- Study group (A) =50 patients will consume ginger tea once daily for 8 weeks.
- Study group (B) = 50 patients will consume Hibiscus tea once daily for 8 weeks.
- Control group =50 patients included in this group, will not consume anything.

Intervention: Qualified participants consumed 1 serving/d (720 mL/d) of H.sabdariffa tea & ginger tea at their second baseline visit and returned once in 15 days for the next 8 weeks for subsequent data collection and reassessment. During each weekly visit, to determine the chronic effects of drinking hibiscus & ginger tea, each participant's BP was measured. At each visit, participants were queried regarding interval changes in health, as well as use of prescription and over-the-counter medications, and dietary supplements Frisoli et al., (2012).

Test beverages: Dried calyces of Hibiscus sabdariffa (Hibiscus) leaves and dried *Zingiber officinale*

(Ginger) were made into a powdered form and 2g of each were measured and put in each of the teabags. All the participants were instructed to steep 2 g of the teabag in 240 mL boiled water for 6 min, then removing the bag of hot water; they were not restricted from their usual dietary and exercise pattern throughout the study period Geaney, (2015). Participant's compliance with tea intake at the end of the study will be assessed by asking them to return unconsumed tea bags, and only readings of those that consumed more than 90% of the tea bags will be included in the final data analysis. Finally, volunteers were informed to report any unusual allergy or abnormal sensations to tea intake and stop drinking the tea immediately.

Measurement of blood pressure: SBP and DBP were measured at the brachial artery by use of a manual sphygmomanometer .Recommended procedures for BP measurement, with all possible efforts to minimize common pitfalls, were observed. A standardized protocol was followed for each BP measurement: the appropriate cuff size for each participant was determined and the same arm and cuff were used for all measurements. Each participant for each measurement was made to sit in a quiet environment in a comfortable chair, with feet on the floor, for 15 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 mins. Values for these 2 determinations of SBP, DBP, were averaged.

Statistical analysis: Data was analysed with SPSS-201 using descriptive and analytical statistics. Frequency, Percentage, and mean standard deviation will be used to describe graphic characteristics. The main statistical tests used in the study – Pearson Chi-square test, Paired t-test & t-test assess differences in characteristics, chi-square test was be used for categorical variables and ANOVA for continuous variabies Ghayur, (2005).

RESULTS & DISCUSSION

Nutritional Analysis of Ginger & Hibiscus Tea Powder

The nutrient analysis was performed using the methods of assessment available in the book of FSSAI -Manual of methods of Analysis of Foods (Food safety and standards authority of india, 2015), aoac (association of official agricultural chemists) & SOP-CHM. The results of nutritional analysis are given in the (Tables 1)

Table1 shows the nutrient composition of Ginger & Hibiscus tea powder .Ginger tea powder was found to be nutritionally superior. The calorific content of Ginger tea powder is 160.3 kcals whereas for the Hibiscus tea powder it is 276.4 .The high calorific value of Hibiscus tea powder may be contributed from saturated fats (Figure 1).

The total carbohydrate content of the Ginger tea powder is 42.6 gms which is comparatively higher than the Hibiscus tea powder, which has a Carbohydrate content of 36.17gms. The low carbohydrate content is due to the low carbohydrate content of Hibiscus (Figure 2).

The total Protein content of the Ginger tea powder is 4.36 gms which is higher than the Hibiscus tea powder, which has a protein content of 3.06 gms. This is due to the high protein content of Ginger compared to Hibiscus Gunathilake & Rupasinghe (2015). Davinder Kaur Gabbi et al in a study revealed that ground ginger powder is higher in protein than other ginger form Figure 3.

AJ Afolayan et al in a study revealed that the fat content of Hibiscus sabdariffa varies depending on the different stages of growth i.e. increases from flowering to maturity, Hence, dried Hibiscus powder has more fat content (1.09 g) when compared to Ginger tea powder having 0.95g fat per 100g .Whereas the total Saturated fat content was found to be lower in Hibiscus tea powder (0.3g) compared to Ginger tea powder (0.46g) Figure 4.

The total sodium content in Ginger tea powder was found to be 14.3 mg per 100g whereas 13.9 mg of Sodium was found in Hibiscus tea powder which depicts no much difference between the two products Figure 5.

Shelf Life Study of Hibiscus Tea Powder

The given Hibiscus tea powder was subjected to microbial, chemical and organoleptic analysis. The results of shelf life study are presented in the following (Tables 2)

The total viable count was found to be less than l0cu/g where the maximum limits were 10, colioform count was found less than 1Ocfu/g where the where the maxium limits specified were Max 10. The Salmonella, E Coli, Pseudomonas and Staphylococcus aureus, were found to be completely absent

Table 1: Nutritional Composition of Ginger and Hibiscus tea powder.

S no.	Parameters	Units	Ginger tea powder	Hibiscus tea powder
1	Energy	Kcal/100g	160.35	276.4
2	Carbohydrate	g/100g	42.6	36.17
3	Protein	g/100g	4.36	3.06
4	Fat	g/100g	1.09	0.95
5	Sugar	g/100g	BLQ	BLQ
6	Saturated Fat	g/100g	0.3	40.02
7	Trans Fat	g/100g	BLQ	BLQ
8	Cholesterol	mg/100g	BLQ	30.23
9	Sodium	mg/100g	14.3	13.97
10	Added Sugar	g/100g	BLQ	BLQ

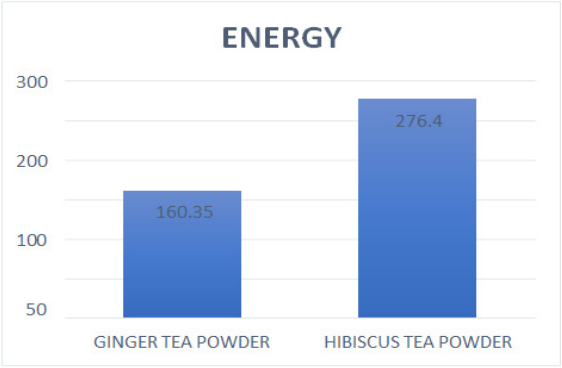

Figure 1. Graphical representation of Energy per 100g of Ginger tea powder and Hibiscus tea powder.

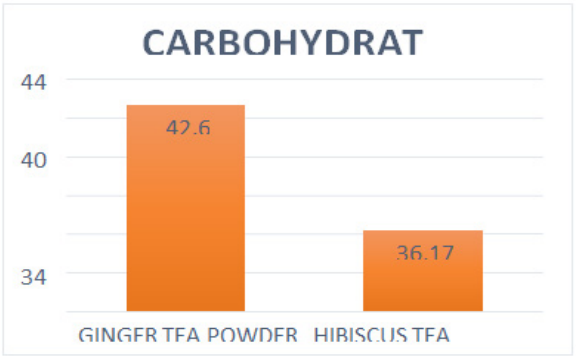

Figure 2. Graphical representation of Total Carbohydrate per 100g of Ginger tea powder and Hibiscus tea powder.

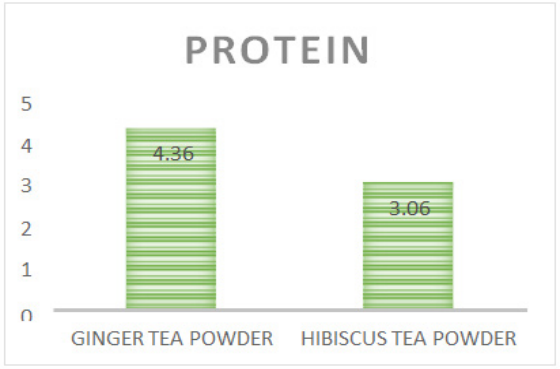

Figure 3. Graphical representation of Protein Content per 100g of Ginger tea powder and Hibiscus tea powder.

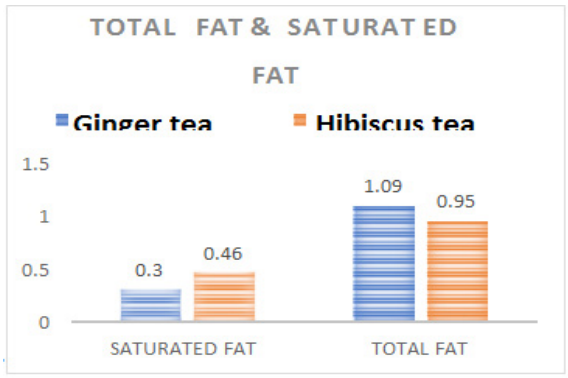

Figure 4. Graphical representation of Total Fat & Saturated Fat Content per 100g of Ginger tea powder and Hibiscus tea powder.

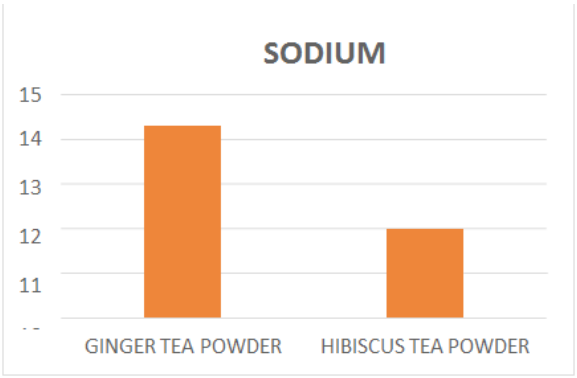

Figure 5. Graphical representation of Sodium Content per 100g of Ginger teapowder and Hibiscus tea powder.

Table 2: Microbial analysis results.

Total Viable count	cfu/g	6.9x10	MAX 107
Colioforms	cfu/g	<40	MAX 100
E Coli	org/g	ABSENT	ABSENT
Salmonella	org/25g	ABSENT	ABSENT
Staphylococcus	org/g	ABSENT	ABSENT
Pseudomonas	org/25g	ABSENT	ABSENT
Shigella	org/25g	<10	ABSENT
Yeast	cfu/g	<20	MAX × 10^3
Mold	cfu/g	<10	MAX × 10^3

Table 3*:* Chemical analysis results.

pH	-	3.5	NOT SPECIFIED
Acidity	g/100g	14.3	NOT SPECIFIED
Moisture	g/100g	5.2	NOT SPECIFIED

Hanifah, (2021). The yeast & mold count were found to be <20 & <10 cfu/g respectively where the maxium specified limits were 1×10 (Table 3).

The Chemical tests which contain ph (5% aqueous sol,), Acidity as lactic acid and Moisture were analyzed and their values were 3.5,14.3g/100g,5.2g/100g respectively (Table 4)

The sensory attribute score was 4 (like moderately) for odour, taste and texture & 3 (neither like nor dislike) for Appearance in terms of colour.

Shelf Life Study of Ginger Tea Powder

Ginger tea powder was subjected to microbial, chemical and organoleptic analysis. The results of shelf life study are presented in the following (Tables 5).

The total viable count was found to be less than 10cu/g where the maximum limits were 10,colioform count was found less than 40 cfu/g where the where the maxium limits specified wre Max 100. The *Salmonella, E Coli, Pseudomonas and Staphylococcus aureus* were found to be completely absent.

The yeast & mold count were found to be <20 & <10 cfu/g respectively where the maxium specified limits were 1×107 (Table 6).

The Chemical tests which contain ph (5% aqueous sol,), Acidity as lactic acid and Moisture were analyzed and their values were 4.4,9.09g/100g,5.22g/100g respectively (Table 7).

The sensory attribute score was 4 (like moderately) for taste and texture & 3(neither like nor dislike) for Appearance in terms of colour Mojiminiyi et al., (2007).The score for odour was 5 (like very much).Both the tea powders were accelerated for 2 weeks in conditions equivalent to 2 months in room temperature. The results of analysis conform to the recommended limits for the tested parameters only and have a shelf life of 2 months Moore et al., (2001).

Demographic Analysis

A total of 150 participants were enrolled for this study of which (n=59 were males and n=91 were females).After randomisation 50 participants (n=23 males and n=27 females) in Hibiscus tea intervention group, 50 participants (n=17 males and n= 33 females) in the Ginger tea intervention group and 50 participants (n=19 males and n= 31 females) were included in the control group. Visibly the number of females was high in the Intervention and control groups but statistically, there was no significance found (P=0.646) when the Pearson Chi-square test was performed (Figure 6, Table 8-10).

Occupation

of all the occupational categories the highest number of participants were from the category of moderate workers (n=86) followed by Sedentary workers (n=53) the least number of participants were from the Heavy working category with only (n=11) respondents. When Pearson Chi-square test was performed, there was no significance found (P=0.232) (Figure 7- 10).

Table 4: Organoleptic analysis results.

Colour	_	3	3 to 5
Odour	_	4	3 to 5
Taste	_	4	3 to 5
Texture	_	4	3 to 5

Table 5: Microbial analysis results.

Total viable count	cfu/g	6.9x10	MAX 107
Colioforms	cfu/g	<40	MAX 100
E coli	org/g	ABSENT	ABSENT
Salmonella	org/25g	ABSENT	ABSENT
Staphylococcus	org/g	ABSENT	ABSENT
Pseudomonas	org/25g	ABSENT	ABSENT
Shigella	org/25g	<10	ABSENT
Yeast	cfu/g	<20	MAX × 10^3
Mold	cfu/g	<10	MAX × 10^3

Table 6: Chemical analysis results.

pH	-	4.4	NOT SPECIFIED
Acidity	g/100g	9.09	NOT SPECIFIED
Moisture	g/100g	5.22	NOT SPECIFIED

Table 7: Organoleptic analysis results.

Colour	_	3	3 to 5
Odour	_	5	3 to 5
Taste	_	4	3 to 5
Texture	_	4	3 to 5

Table 8: Distribution of participants among the control and intervention groups based onsex.

Groups	Male	Female	Total
Control	19	31	50
Ginger	17	33	50
Hibiscus	23	27	50
TOTAL	59	91	150

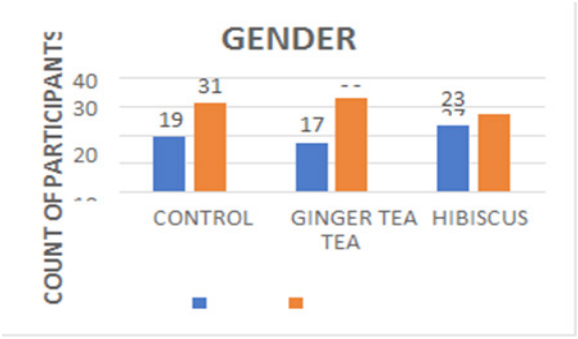

Figure 6. Distribution of participants among the control and intervention groups based on sex.

Table 9: Chi-Square Tests for sex.

Value		df	Asymptotic Significance (2-sided)
Pearson Chi- Square	.872[a]	2	.646
Likelihood Ratio	.867	2	.648
N of Valid Cases	153		

Table 10: Distribution of participants among the control and intervention groups based onoccupation.

Groups	Sedentary	Moderate	HeavyWorkers	Total
Control	13	32	5	50
Ginger	20	25	5	50
Hibiscus	20	29	1	50
TOTAL	53	86	11	150

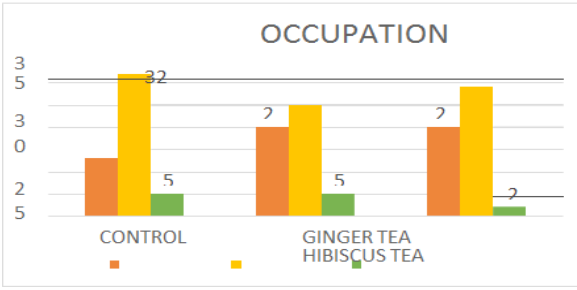

Figure 7. Distribution of participants among the control and intervention groups based on occupation.

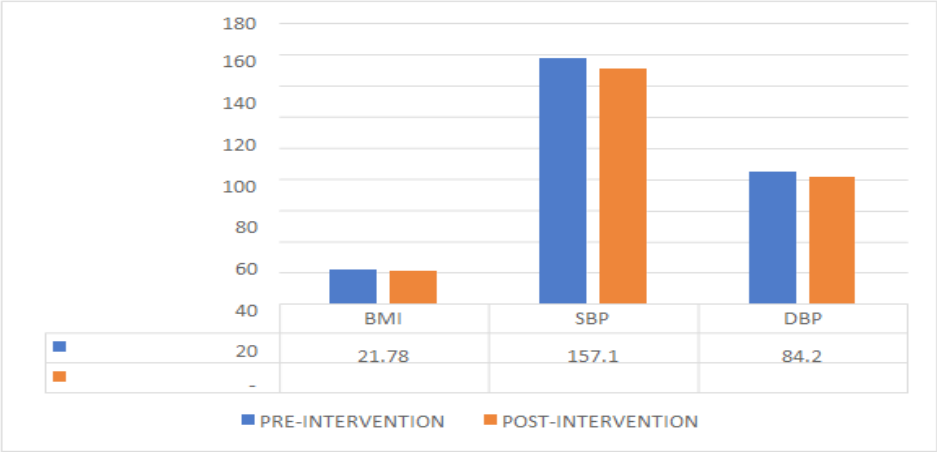

Figure 8. Effect of Hibiscus tea on BMI,SBP & DBP post intervention.

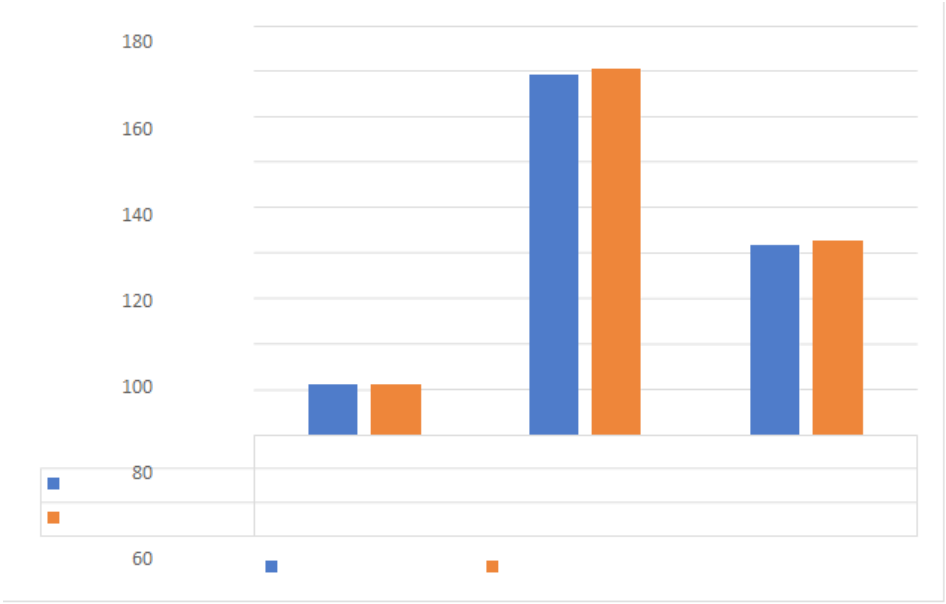

Figure 9. Effect of Ginger tea on BMI,SBP & DBP post-intervention.

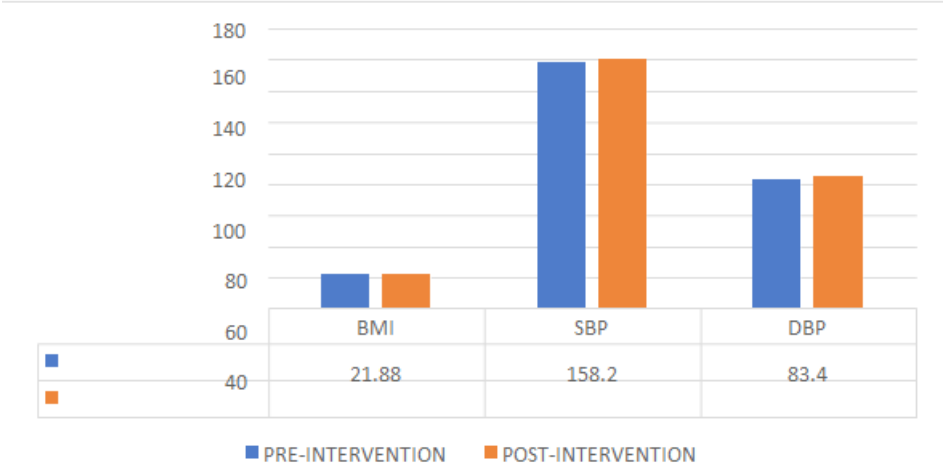

Figure 10. Effect on BMI,SBP & DBP in control group.

CONCLUSION

In this study, we investigated the effects of Hibiscus sabdariffa and Ginger tea on blood pressure in hypertensive patients. The results showed that the eight weeks tea intervention had a significant positive impact on SBP, & DBP. In this current study, both the HS and Ginger tea lowered blood pressure whereas the blood pressure levels increased in the control group. Even though both the teas had an antihypertensive effect on the hypertensive individuals, Ginger tea was found to be more effective than Hibiscus tea. The results from this study are in agreement with most of the previous clinical and experimental studies on antihypertensive effects of HS tea & Ginger tea.

The significant effect of Ginger may be explained by its high content of Gingerol. It has been shown previously that gingerol acts as an ACE inhibitor in the management of hypertension. 6-gingerol interacts with ACE forming eight amino acids. 13 amino acid residues in the ACE binding site were discovered to be blocked by the ligands from ginger. Therefore, the compounds have potential roles as inhibitors, and this possibly helps to prevent regulation of the reninangiotensin system. These interactions also formed hydrogen bonds, as well as electrostatic, unfavourable, and hydrophobic sites, making the binding stronger than others.

It was suggested by Fugh-Berman (2000 that data from his study indicated that Ginger's' Blood Pressure lowering effect was mediated through the blockade of voltage-

dependent calcium channels. Another suggested mechanism may involve the serotonergic antagonistic property of ZO (Ghayur & Ghilani; 2005).

According to Srivastava, (1984), the fact that ZO consumption can lead to an increase in blood flow to the periphery of blood vessels indicates that the resistance of blood has been partially overcome. So by implication, Ginger reduces total peripheral resistance. (Egan & Stammered; 1988), which thereby reduces the arterial BP.

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