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Research Article

A CLINICAL STUDY OF THE EFFECT OF SOME ANTIHYPERTENSIVE DRUGS AND MEDICINAL PLANTS ON PATIENTS WITH ESSENTIAL HYPERTENSION

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ABSTRACT

Back ground: Hypertension is the most common disease and a major risk factor for the development of cardiovascular and renal diseases. **Objective**: Assessment the effect of medicinal plants Garlic (G), *Nigella sativa* (NS), *Hibiscus sabdariffa* (HS) and to adjustment their appropriate concentration in lowering the essential hypertension (EHT) and evaluate their effects on renal functions. **Methods**: One hundred-ten patients with mild, moderate and sever EHT had treated by various antihypertensive drugs and medicinal plants (G, NS, HS). Arterial blood pressure, renal functions were measured before and after they had their treatment. **Results**: Administration of G, NS, HS produced a significant lowering effect in the arterial blood pressure in patients with EHT when they were used alone or in combination with antihypertensive drugs. **Conclusion**: Garlic, *Nigella sativa*, *Hibiscus sabdariffa* were effective, safe, cheaper and recommended for EHT.

Keywords: Essential hypertension, Garlic, *Nigella sativa*, *Hibiscus sabdariffa.*

INTRODUCTION

Essential hypertension (EHT) is the most common type of hypertension, accounting for 95% of all causes of high blood pressure (15) and considered the third leading killer disease in the world (44) . Several studies have been conducted to determine the factors that are responsible for EHT, age (40) , heredity (14) stress, obesity (33) , alcohol intake (41) , race, smoking, coffee drinking (21) , toxic metals. Long duration of EHT caused several complications that affected cardiovascular system (20) (29) , cerebrovascular (9) , renal system (36) , (17) , (46) , retinal (10) , large vessels (7) .

The efficacy of treatment EHT was tested in three well-known medicinal plants namely, Garlic, *Nigella sativa*, *Hibiscus sabdariffa* which were proved to be effective in treatment of hypertensive patients.

METHODS

This study was carried out in Baghdad / the Al-Kadimyia Teaching Hospital. (110) patients were involved in the study with the range of age between (50.3-52.4) years for (72) females and (38) males, with mean body weight (80) kilograms and complaining from moderate to severe EHT before therapy. The patients were allocated in thirteen groups treated by antihypertensive drugs (ramipril, amlodipine, valsartan and metoprolol) Table(1) which were used alone or in combination, duration of treatment are four weeks. Three medicinal plants (G, NS and HS) were used daily in a dose of 5g of fresh G as tablets orally with meal, 1g of NS as capsules orally, 15g of HS as infusion orally before breakfast.

These plants were used plus the above drugs related to each group which was used for another four weeks of treatment. The patients related to groups (11, 12, 13) have (5 patients) for each group, suffered from mild to moderate EHT and treated by one medicinal plant which

was used alone for duration of four weeks. Measurement of arterial blood pressure weekly. To determine the renal functions,{ blood urea (BU), creatinine (Cr), uric acid (UA), Na, K, Ca} blood samples were taken from all patients who have no prior treatment after 12-14 hours fasting period and then every two weeks after onset of treatment for 4,8 weeks.

Table 1: Showed the groups of hypertensive patients which were treated orally by different regimens of drugs

Group No.	No. of patients + different regimens of drugs
Group one	(12 patients) were treated by combination of ramipril 5 mg + amlodipine 2.5 mg.
Group two	(11 patients) were treated by amlodipine 5 mg.
Group three	(12 patients) were treated by amlodipine 10 mg.
Group four	(11 patients) were treated by valsartan 160 mg.
Group five	(6 patients) were treated by ramipril 10 mg.
Group six	(12 patients) were treated by valsartan 80 mg.
Group seven	(12 patients) were treated by combination of amlodipine 5 mg + valsartan 160 mg + metoprolol 50 mg.
Group eight	(6 patients) were treated by combination of valsartan 80 mg + amlodipine 10 mg + metoprolol 50 mg.
Group nine	(6 patients) were treated by combination of amlodipine 5 mg + metoprolol 50 mg.
Group ten	(7 patients) were treated by combination of amlodipine 10 mg + metoprolol 50 mg.

Statistical analysis

The Complete Randomized Design (CRD), ANOVA with Statistical Analysis System (SAS) was used to study the effects of period before treatment 1,2,3,4 weeks on differences traits. LSD test and Duncan's multiple range was used to comparative significant differences between the means, (37) .

RESULTS

There was a significant reduction at p<0.01 in the arterial blood pressure levels of all patients who were treated with different regimens of drugs throughout the four weeks of treatment Table (2).Table (3) shows that there was a significant decrease in arterial blood pressure levels (systolic and diastolic) at p<0.01, p<0.05 in groups treated by medicinal plants when were used alone or in a combination with drugs duration the period of treatment. Antihypertensive therapy caused improvement in some renal functions as serum (BU, Cr, UA, Na, K, Ca) with some groups throughout the period of treatment Table (4). Using (G) alone or combination caused a significant decrease in serum Cr groups (2, 5, 7, 8, 11) also a s significant decrease in serum BU,UA in groups (7, 11) and significant reduction in serum Na level groups (1, 3, 5, 7, 8, 9, 11) after treatment Table (5). While using (NS, HS) in treatment of patients with EHT in combination with drugs or alone cause no improvement in renal functions in most groups throughout the treatment Table (6).

Table (2): The means of arterial blood pressure levels (systolic and diastolic) mm Hg in patients with EHT throughout the four weeks of treatment by different regimens of drugs

Group No.		Before treatment	After one week of treatment	After two weeks of treatment	After three weeks of treatment	After four weeks of treatment	L SD
Group one	Systolic	A 178.83 ± 6.18	B 156.75 ± 9.70	C 147.00 ± 6.10	C 143.75 ± 4.94	C143.50± 4.34	**5.26
	Diastolic	A 110.75 ± 4.61	B 95.83 ± 3.59	C 91.25 ± 4.83	D 87.08 ± 6.20	D 84.58 ± 4.98	** 4.02
Group two	Systolic	A 168.10 ± 5.26	B 154.91 ± 8.64	C 146.82 ± 2.32	C 145.65 ± 3.19	D 140.46 ± 7.57	**5.07
	Diastolic	A 106.55 ± 1.57	B 91.18 ± 1.47	B 90.52 ± 1.48	CB 89.95 ± 1.40	C 88.64 ± 1.91	**1.35
Group three	Systolic	A 195.42 ± 11.37	B 164.17 ± 13.11	C 151.25 ± 13.34	C 145.42 ± 9.64	C 143.75 ± 6.08	**9.03
	Diastolic	A 109.58 ± 9.16	B 92.92 ± 3.34	C 85.83 ± 2.89	C 84.17 ± 3.59	C 82.50± 2.61	**4.06
Group four	Systolic	A 184.82 ± 10.17	B 150.91 ± 9.96	B 147.45 ± 7.66	B 146.91 ± 6.79	B 145.46 ± 6.11	**7.11
	Diastolic	A 107.33 ± 9.84	B 94.11 ± 8.89	B 90.11 ± 6.66	CB 88.64 ± 6.52	C 83.55 ± 4.06	** 6.26
Group five	Systolic	A 196.67 ± 17.22	B 170.00 ± 19.49	CB 156.67 ± 15.38	C 150.00 ± 11.83	C 145.83 ± 9.17	**17.94
	Diastolic	A 115.83 ± 9.17	B 105.00 ± 10.49	CB 98.33 ± 5.16	CB 96.67 ± 4.08	C 95.00 ± 3.16	**8.37
Group six	Systolic	A 162.50 ± 4.26	BA 159.16 ± 8.53	BC153.33 ± 11.09	C 151.25 ± 7.68	C 150.00 ± 2.98	**6.14
	Diastolic	A 94.58 ± 6.82	BA 91.25 ± 4.26	B 89.58 ± 5.12	B 89.25 ± 3.62	C 85.00 ± 1.71	**3.78
Group seven	Systolic	A 216.66 ± 11.94	B 179.58 ± 6.82	C 165.65 ± 12.79	DC 159.33 ± 8.53	D 155.14 ± 5.12	**7.78
	Diastolic	A 131.25 ± 9.38	B 108.10 ± 5.12	C 101.95 ± 5.97	DC 97.17 ± 5.97	D 95.50 ± 4.69	**5.27
Group eight	Systolic	A 200.83 ± 17.15	B 183.33 ± 8.76	B 179.17 ± 8.01	B 172.50 ± 5.24	C 160.50 ± 5.43	**11.80
	Diastolic	A 116.67 ± 5.16	B 105.83 ± 6.65	CB 100.00 ± 6.32	C 97.17 ± 4.88	C 96.67 ± 4.08	**6.54
Group nine	Systolic	A 165.00 ± 10.49	BA 155.83 9.70 ±	BC 152.50 ± 7.58	BC 149.17 ± 6.65	C 144.17 ± 6.65	**9.95
	Diastolic	A 103.33 ± 9.31	B 94.17 ± 5.85	B 92.50 ± 5.24	B 90.00 ± 3.16	C 81.67 ± 2.58	**6.83
Group ten	Systolic	A 202.50 ± 10.84	B 177.50 ± 10.37	CB 167.50 9.35 ±	CD 158.67 ± 12.44	D 150.83 ± 13.57	**13.57
	Diastolic	A 113.33 ± 10.33	B 104.17 ± 8.01	CB 100.83 ± 7.36	CB 97.00 ± 2.45	C 94.00 ± 5.83	**8.66

Table 3: The means of arterial blood pressure levels (systolic and diastolic) mmHg in patients with EHT throughout the four weeks of treatment by different regimens of drugs in groups(1,2,3,5,7,8,9) Plus (G) or treatment by (G) alone group (11)

Group No.		Before treatment plus (G)	After one week of treatment plus (G)	After two weeks of treatment plus (G)	After three weeks of treatment plus (G)	After four weeks of treatment plus (G)	LSD
Group one No.(6)	Systolic	A 144.17 ± 4.92	BA 143.33 ± 4.08	BC 137.50 ± 5.24	DC 132.50 ± 7.58	D 126.67 ± 5.16	**6.57
	Diastolic	A 85.00 ± 6.32	A 83.33 ± 6.06	A 81.67 ± 4.08	A 81.00 ± 2.45	B 71.83 ± 4.17	**5.74
Group two No.(5)	Systolic	A 140.00 ± 0	BA 138.00 ± 4.47	B 135.00 ± 5.00	C 128.00 ± 4.47	D 120.40 ± 0.89	**4.79
	Diastolic	A 88.8 ± 2.17	B 84.00 ± 4.18	B 83.00 ± 2.24	B 81.00 ± 4.24	C 72.00 ± 2.51	**4.23
Group three No.(6)	Systolic	A 144.17 ± 8.01	A 140.83 ± 11.14	BA 135.00 ± 8.37	B 130.00 ± 6.32	B 125.83 ± 8.01	**10.13
	Diastolic	BA 81.67 ± 2.58	A 82.50 ± 2.74	BA 80.83 ± 2.04	B 79.00 ± 2.00	C 72.50 ± 2.74	**2.90
Group five No.(6)	Systolic	A 145.83 ± 9.17	BA 140.83 ± 9.17	BC 133.33 ± 12.11	BC 130.83 ± 9.17	C 126.00 ± 6.16	**11.12
	Diastolic	A 95.00 ± 3.16	BA 91.67 ± 2.58	BC 89.17 ± 2.04	C 86.67 ± 5.16	D 80.17 ± 3.60	** 4.14
Group Seven No.(6)	Systolic	A 155.28 ± 10.36	BA 151.00 ± 12.31	BA 144.83 ± 8.73	B 141.00 ± 9.27	B 140.83 ± 7.36	*11.59
	Diastolic	A 95.67 ± 3.39	A 94.33 ± 2.16	B 88.50 ± 4.18	B 87.33 ± 4.08	B 85.83 ± 5.85	**4.89
Group eight No.(6)	Systolic	A 160.50 ± 5.43	A 157.50 ± 6.12	BA 151.67 ± 7.53	BC 143.33 ± 11.69	C 140.33 ± 9.42	**9.93
	Diastolic	A 96.67 ± 4.08	B 89.17 ± 4.92	B 88.33 ± 4.08	B 87.50 ± 4.18	B 85.50 ± 3.39	**4.95
Group nine No.(6)	Systolic	A 144.17 ± 6.65	BA 141.67 ± 4.08	B 137.50 ± 4.18	C 136.00 ± 5.48	C 124.17 ± 4.92	**6.12
	Diastolic	BA 81.67 ± 2.58	A 85.00 ± 4.47	A 85.00 ± 4.50	B 80.83 ± 2.04	C 76.83 ± 2.04	**3.94
Group eleven No.(5)	Systolic	A 145.00 ± 7.07	A 144.40 ± 6.07	BA 136.00 ± 8.94	BC 133.00 ± 7.58	C 125.00 ± 7.07	**9.77
	Diastolic	BA 94.00 ± 4.18	A 96.00 ± 2.34	B 92.00 ± 2.74	C 86.00 ± 2.24	C 84.00 ± 2.24	**3.73

Table 3: The mean of arterial blood pressure levels (systolic and diastolic)mmHg in patients with EHT throughout the four weeks of treatment by different regimens of drugs in groups(1,2,3,4,6) plus (NS) or treatment by (NS) alone in group (12)

Group No.		Before treatment plus (NS)	After one week of treatment plus (NS)	After two weeks of treatment plus (NS)	After three weeks of treatment plus (NS)	After four weeks of treatment plus (NS)	LSD
Group one No.(6)	Systolic	A 142.83± 4.02	BA 139.17± 3.76	BC 134.17± 3.76	DC 130.00± 5.45	D 125.83± 6.65	**5.79
	Diastolic	A 85.83± 5.85	BA 82.67± 4.32	B 80.83± 2.04	B 78.33± 4.08	C 72.50± 2.74	**4.79
Group two No.(5)	Systolic	A 144.50± 3.39	B 139.17 ± 3.76	C 132.50± 4.18	C 129.17± 3.76	D 124.17± 4.92	**4.80
	Diastolic	A 88.50± 1.87	BA 85.00± 3.16	B 83.33± 4.08	B 82.50± 2.74	C 76.50± 4.18	**3.95
Group three No.(6)	Systolic	A 143.33± 4.08	A 139.33 ± 4.08	B 133.33± 5.16	C 127.83± 3.49	D 118.00± 4.00	**4.99
	Diastolic	A 82.50± 2.74	BA 81.67± 2.58	B 81.33± 2.16	B 78.67± 2.16	C 67.67± 4.59	**3.55
Group four No.(5)	Systolic	A 145.00± 5.00	B 132.00± 8.37	CB 128.00±4.47	CD 120.20± 6.34	D 115.00± 4.8	**7.88
	Diastolic	A 83.80± 4.15	A 83.00± 4.47	A 82.00± 4.47	A 80.40± 2.88	B 72.60± 2.51	**4.99
Group six No.(6)	Systolic	A 148.33± 5.16	B 139.17±4.92	CB 134.67±4.08	CD 130.83± 2.04	D 128.00± 5.10	**5.26
	Diastolic	A 84.50 ± 3.39	A 85.00± 4.47	A 83.33± 5.16	A 81.00± 4.69	B 74.50± 3.94	**5.20
Group twelve No.(5)	Systolic	A 146.00± 10.84	A 150.00± 6.12	A 144.00± 4.18	BA 142.00± 4.47	B 135.00± 6.12	*8.95
	Diastolic	A 95.00± 3.54	A 95.00± 3.54	A 95.00± 3.53	A 95.00± 3.54	B 75.00± 5.00	**5.11

Table (3): The mean of arterial blood pressure levels (systolic and diastolic)mmHg in patients with EHT throughout the four weeks of treatment by different regimens of drugs in groups(4,6,7,10) plus (HS) or treatment by (HS) alone in group (13)

Group No.		Before treatment plus (HS)	After one week of treatment plus (HS)	After two weeks of treatment plus (HS)	After three weeks of treatment plus (HS)	After four weeks of treatment plus (HS)	LSD
Group four No.(6)	Systolic	A 145.83 ± 7.36	A 140.83 ± 2.04	B 131.67 ± 4.08	B 126.67 ± 5.16	C 115.00 ± 8.37	**6.97
	Diastolic	B 83.33 ± 4.37	A 89.17 ± 2.04	BA 85.00 ± 5.48	C 75.83 ± 4.92	D 68.33 ± 5.16	**5.42
Group six No.(6)	Systolic	A 151.67 ± 2.58	A 150.83 ± 6.65	B 141.67 ± 8.16	B 136.67 ± 7.53	C 127.50 ± 8.80	**8.44
	Diastolic	B 87.17 ± 3.37	A 92.50 ± 4.18	B 87.50 ± 4.18	CB 83.33 ± 4.08	C 79.17 ± 2.04	**4.36
Group seven No.(6)	Systolic	A155.00 ± 8.37	BA 151.67 ± 6.80	BC 145.33 ± 5.89	C 138.17 ± 6.99	D 120.83 ± 9.17	**8.96
	Diastolic	A 95.33 ± 3.67	A 93.33 ± 2.58	BA 90.00 ± 4.47	B 85.83 ± 3.76	C 71.67 ± 7.53	**5.60
Group ten No.(7)	Systolic	A 150.83 ± 13.57	A 145.83 ± 12.42	BA 138.33 ± 11.25	BC 130.33 ± 8.41	C 121.67 ± 4.27	**12.52
	Diastolic	A 94.00 ± 5.83	BA 91.33 ± 7.12	BC 87.00 ± 6.32	C 84.33 ± 3.83	C 82.17 ± 4.49	**6.72
Group thirteen No.(5)	Systolic	A 162.00 ± 7.58	B 144.00 ± 8.94	C 134.00 ± 8.94	CB 135.00 ± 6.12	C 130.00 ± 3.54	**9.65
	Diastolic	A 104.00 ± 5.48	A 100.60 ± 5.64	A 102.20 ± 3.19	B 90.00 ± 3.54	C 84.00 ± 4.18	**5.96
Group No.		Before treatment plus (HS)	After one week of treatment plus (HS)	After two weeks of treatment plus (HS)	After three weeks of treatment plus (HS)	After four weeks of treatment plus (HS)	LSD
Group four No.(6)	Systolic	A 145.83 ± 7.36	A 140.83 ± 2.04	B 131.67 ± 4.08	B 126.67 ± 5.16	C 115.00 ± 8.37	**6.97
	Diastolic	B 83.33 ± 4.37	A 89.17 ± 2.04	BA 85.00 ± 5.48	C 75.83 ± 4.92	D 68.33 ± 5.16	**5.42
Group six No.(6)	Systolic	A 151.67 ± 2.58	A 150.83 ± 6.65	B 141.67 ± 8.16	B 136.67 ± 7.53	C 127.50 ± 8.80	**8.44
	Diastolic	B 87.17 ± 3.37	A 92.50 ± 4.18	B 87.50 ± 4.18	CB 83.33 ± 4.08	C 79.17 ± 2.04	**4.36
Group seven No.(6)	Systolic	A155.00 ± 8.37	BA 151.67 ± 6.80	BC 145.33 ± 5.89	C 138.17 ± 6.99	D 120.83 ± 9.17	**8.96
	Diastolic	A 95.33 ± 3.67	A 93.33 ± 2.58	BA 90.00 ± 4.47	B 85.83 ± 3.76	C 71.67 ± 7.53	**5.60
Group ten No.(7)	Systolic	A 150.83 ± 13.57	A 145.83 ± 12.42	BA 138.33 ± 11.25	BC 130.33 ± 8.41	C 121.67 ± 4.27	**12.52
	Diastolic	A 94.00 ± 5.83	BA 91.33 ± 7.12	BC 87.00 ± 6.32	C 84.33 ± 3.83	C 82.17 ± 4.49	**6.72
Group thirteen No.(5)	Systolic	A 162.00 ± 7.58	B 144.00 ± 8.94	C 134.00 ± 8.94	CB 135.00 ± 6.12	C 130.00 ± 3.54	**9.65
	Diastolic	A 104.00 ± 5.48	A 100.60 ± 5.64	A 102.20 ± 3.19	B 90.00 ± 3.54	C 84.00 ± 4.18	**5.96

Table (4): The means of serum (BU) mmol/L, (Cr) Mmol/L , (UA)Mmol/L levels in patients with EHT throughout the four weeks of treatment by different regimens of drugs

Group No.		Before treatment	After two weeks of treatment	After four weeks of treatment	LSD
Group one	S.BU	A 5.34± 0.45	A 5.01± 0.44	B 4.40± 0.57	**0.41
	S.Cr	A 92.08± 6.33	A 92.00± 6.82	A98.00± 9.68	6.44
	S.UA	B 282.50± 38.97	A 344.83± 40.81	A372.85± 38.56	**32.78
Group two	S.BU	B 3.47± 0.51	A 3.93± 0.41	BA3.81± 0.35	*0.37
	S.Cr	A 74.64± 7.07	A 75.46± 7.29	A72.18± 6.69	6.11
	S.UA	A 225.55± 31.29	A 236.10± 29.88	A228.45± 29.95	26.46
Group three	S.BU	A 6.15± 1.29	A 5.27± 0.96	B 4.10± 1.02	**0.91
	S.Cr	A 94.83± 18.17	A 86.75± 17.70	A85.17± 16.02	14.38
	S.UA	A 273.08± 56.72	A 290.33± 52.16	A293.42± 46.02	43.04
Group four	S.BU	B 6.14± 0.94	A 5.92± 0.96	A5.60± 0.95	0.83
	S.Cr	A 96.00± 9.94	B 85.64± 8.63	B 85.09± 8.07	*7.76
	S.UA	A 250.27± 63.13	A 242.10± 59.63	A236.09± 54.52	51.55
Group five	S.BU	B 4.43± 0.34	A 5.03± 0.29	A5.16± 0.29	**0.38
	S.Cr	A 98.50± 8.41	A 96.33± 7.23	A99.67± 6.86	9.26
	S.UA	A 230.12± 48.19	A 259.00± 48.53	A260.33± 48.57	59.60
Group six	S.BU	A 3.40± 0.17	A 3.25± 0.21	A 3.25± 0.43	0.24
	S.Cr	A 76.83± 4.26	A 77.50± 5.12	A 77.75± 5.97	4.30
	S.UA	A 226.41± 17.06	BA 221.41± 7.68	B 216.25± 7.68	*9.69
Group seven	S.BU	A4.10± 0.09	B 3.86± 0.09	C 2.60± 0.09	**0.07
	S.Cr	A78.00± 4.26	A 77.70± 2.56	B 69.08± 5.12	**3.42
	S.UA	A 358.00± 17.06	B 312.41± 10.23	C 277.25± 14.50	**11.80
Group eight	S.BU	A 4.50± 0.60	A 4.00± 0.53	B 3.20± 0.22	**0.59
	S.Cr	A 83.67± 4.72	BA 80.83± 4.54	B 76.50 ± 4.04	*5.46
	S.UA	A 269.83± 46.84	A 227.00± 65.64	A 240.50± 63.94	73.12
Group nine	S.BU	A 5.23± 1.06	A 5.31± 0.84	A5.54± 0.64	1.06
	S.Cr	A 79.00± 13.02	A 74.33± 8.33	A 70.00± 6.63	11.95
	S.UA	A 256.67± 31.89	A 275.33± 18.60	A 284.67± 16.84	28.83
Group ten	S.BU	A 4.57± 0.70	A 4.41± 0.68	B 3.46± 0.74	*0.87
	S.Cr	A 74.17± 5.91	BA 68.00± 5.55	B 63.83± 3.87	*6.38
	S.UA	B 248.33± 46.60	A 310.00± 36.47	A 326.50± 24.62	**45.54

Table 4: The means of serum (Na,K,Ca) mmol/L levels in patients with EHT throughout the four weeks of treatment by different regimens of drugs

Group No.		Before treatment	After two weeks of treatment	After four weeks of treatment	LSD
Group one	S.Na	B 139.08± 1.90	A 143.00± 2.95	B 140.08± 1.98	**1.93
	S.K	A 5.10±0.51	A 5.00± 0.43	A 4.79± 0.50	0.40
	S.Ca	BA 2.08± 0.56	A 2.16± 0.43	B 1.71± 0.42	*0.39
Group two	S.Na	B 136.09± 3.24	B 137.10± 0.46	A 141.09±2.81	**2.49
	S.K	B 3.95± 0.34	A 4.25± 0.33	A 4.27± 0.20	*0.26
	S.Ca	A 2.21± 0.29	B1.91± 0.27	B 1.80± 0.19	**0.22
Group Three	S.Na	A 142.33± 0.98	A 142.48± 0.96	A 142.65± 0.98	0.81
	S.K	A 4.44± 0.15	A 4.46± 0.22	A 4.32± 0.22	0.17
	S.Ca	A 2.78± 0.36	A 2.64± 0.36	A 2.57± 0.40	0.31
Group Four	S.Na	A 141.09±2.07	A 141.00 ± 1.55	A 142.09±2.34	1.75
	S.K	A 5.02± 0.45	A 4.91± 0.31	A 4.71±0.44	0.35
	S.Ca	A 2.70± 0.39	B 2.03± 0.51	B2.21± 0.44	**0.39
Group Five	S.Na	B 141.33± 1.21	B 141.00± 1.26	A 143.33± 1.37	*1.58
	S.K	A 4.20± 0.23	A 4.10± 0.14	A 4.30± 0.39	0.34
	S.Ca	A 2.34± 0.49	A 2.23± 0.34	A 2.59± 0.15	0.44
Group Six	S.Na	A 141.66±7.67	A 141.55± 8.53	A 141.25±9.38	7.11
	S.k	A 4.38± 0.06	B 4.29±0.03	C4.09± 0.02	**0.03
	S.Ca	C 1.46± 0.03	B1.57± 0.05	A 2.18± 0.03	**0.03
Group Seven	S.Na	A 145.00± 8.53	A 142.00±6.82	A 139.00± 7.68	6.40
	S.K	B 4.50± 0.09	B 4.50± 0.09	A 4.60± 0.08	**0.07
	S.Ca	A 2.65± 0.03	B 2.40± 0.34	C 2.03± 0.03	**0.16
Group Eight	S.Na	A 141.00± 2.19	A 140.67±1.21	A 139.83 ± 0.98	1.91
	S.K	A 4.25± 0.19	BA 4.16± 0.18	B 4.01± 0.11	*0.20
	S.Ca	A 2.24± 0.16	A 2.21± 0.22	A 1.99 ± 0.25	0.26
Group Nine	S.Na	A 141.67± 1.97	A 140.83± 2.40	A 141.17±1.47	2.44
	S.K	A 4.25± 0.24	A 4.33± 0.15	A 4.46± 0.11	0.22
	S.Ca	A 3.08± 0.44	BA 2.63± 0.59	B 2.39± 0.58	*0.67
Group Ten	S.Na	BA141.83±1.94	A 143.33± 1.03	B 141.17± 0.98	*1.71
	S.K	A 4.53± 0.40	A 4.33± 0.28	A 4.20± 0.17	0.37
	S.Ca	A 2.55± 0.29	A 2.53± 0.19	A 2.32± 0.17	0.28

Table 5: The means of serum (BU) mmol/L, (Cr) Mmol/L , (UA)Mmol/L levels in patients with EHT throughout the four weeks of treatment by different regimens of drugs in groups (1,2,3,5,7,8,9) plus (G) or treatment with (G) alone in group (11)

Group No.		Before treatment	After two weeks of treatment plus (G)	After four weeks of treatment plus (G)	LSD
Group one No.(6)	S.BU	A 4.52± 0.65	A 4.37±0.63	A 4.30± 0.61	0.77
	S.Cr	A97.67± 12.21	A 92.17 ± 11.63	A 84.50 ±8.53	13.43
	S.UA	A350.00± 39.28	A341.33 ±39.04	A 333.50± 38.93	48.09
Group two No.(5)	S.BU	A 3.84± 0.43	A 3.71± 0.40	A 3.60± 0.41	0.57
	S.Cr	A 72.80± 7.20	B66.00± 3.81	B63.00 ± 1.41	*6.57
	S.UA	A 234.60± 38.29	A 226.00± 37.76	A 217.40±40.43	53.52
Group three No.(6)	S.BU	A4.85 ±0.31	A4.73 ± 0.38	A 4.60 ± 0.39	0.45
	S.Cr	A86.00 ± 16.29	A77.50 ±11.95	A 74.00 ± 9.88	15.97
	S.UA	A 294.33 ±50.07	A287.00 ± 41.30	A 277.67 ± 37.53	53.27
Group five No.(6)	S.BU	A 5.16± 0.29	A 5.11±0.26	A 4.96± 0.28	0.34
	S.Cr	A 99.67 ± 6.86	BA96.33 ±7.66	B90.17± 5.19	*8.18
	S.UA	A260.33 ±48.57	A248.17 ± 46.74	A 240.00± 50.89	60.01
Group seven No.(6)	S.BU	A2.90 ± 0.44	B2.36 ±0.42	B2.01 ± 0.39	**0.52
	S.Cr	A 72.17±9.70	BA 67.83±4.54	B63.50 ±2.59	*7.83
	S.UA	A289.00 ±62.77	A284.33 ±57.68	A 276.83 ±48.07	69.54
Group eight No.(6)	S.BU	A3.20 ± 0.22	A 3.12±0.22	A 3.00±0.14	0.24
	S.Cr	A 76.50 ±4.04	A75.86 ±5.18	B69.50 ±5.89	*6.27
	S.UA	A240.50 ±63.94	A233.50 ±61.58	A225.17 ±63.40	77.50
Group nine No.(6)	S.BU	A5.54 ±0.64	A 5.40± 0.56	A5.30 ± 0.61	0.75
	S.Cr	A70.00 ±6.63	A 66.00±7.24	A 62.50 ± 4.72	7.74
	S.UA	A 248.76±16.84	A 275.00± 15.62	A270.00 ± 18.43	20.92
Group eleven No.(5)	S.BU	A 3.34±0.57	A3.22± 0.69	A 3.10± 0.52	0.82
	S.Cr	A 75.40 ±8.79	BA71.00±7.97	B 64.00±5.87	*10.53
	S.UA	A168.80 ±5.26	BA 165.80 ±4.82	B159.40 ± 5.64	*7.24

Table 5: The means of serum (Na,K,Ca) mmol/L levels in patients with EHT throughout the four weeks of treatment by different regimens of drugs in groups (1,2,3,5,7,8,9) plus (G)or treatment with (G) alone in group (11)

Group No.		Before treatment	After two weeks of treatment plus (G)	After four weeks of treatment plus (G)	LSD
Group one No.(6)	S.Na	A 140.33± 1.37	BA 139.10±2.06	B 137.57± 1.95	*2.24
	S.K	A 4.96± 0.27	A 4.98± 0.25	A 5.04± 0.28	0.33
	S.Ca	A 1.92± 0.32	A 1.96± 0.33	A 2.05± 0.34	0.41
Group two No.(5)	S.Na	A 141.00± 4.18	A 139.20± 2.39	A 138.25± 2.50	4.32
	S.K	A 4.26± 0.21	A 4.29± 0.22	A 4.35±0.21	0.29
	S.Ca	A 1.76± 0.14	A 1.83± 0.15	A 1.87±0.22	0.24
Group three No.(6)	S.Na	A 142.48± 0.91	B 140.76± 0.93	B 139.70± 1.16	**1.24
	S.K	A 4.30± 0.31	A 4.34± 0.33	A4.41± 0.35	0.41
	S.Ca	A 2.33±0.22	A 2.37± 0.44	A 2.43± 0.44	0.47
Group five No.(6)	S.Na	A 143.33± 1.37	BA 142.33±2.58	B 140.54± 1.90	*2.48
	S.K	A 4.30± 0.39	A 4.32± 0.13	A 4.39± 0.15	0.31
	S.Ca	A 2.59± 0.15	A 2.62± 0.12	A 2.70± 0.09	0.15
Group seven No.(6)	S.Na	A 138.83± 2.04	BA 137.67±1.75	B 136.05± 2.02	*2.39
	S.K	B 4.58± 0.30	BA 4.81± 0.19	A 5.00±0.30	*0.33
	S.Ca	A 2.08± 0.28	A 2.11± 0.26	A 2.21±0.34	0.36
Group eight No.(6)	S.Na	A 139.83± 0.98	BA 139.14±1.12	B 137.82± 1.12	*1.33
	S.K	A 4.01± 0.11	A 4.15± 0.37	A 4.10± 0.20	0.31
	S.Ca	A 1.99± 0.25	A 2.11± 0.20	A 2.14± 0.18	0.26
Group nine No.(6)	S.Na	A 141.17± 1.47	A 141.07± 1.49	B 138.66± 2.18	*2.15
	S.K	C 4.46± 0.11	B 4.76± 0.14	A 4.96± 0.14	**0.17
	S.Ca	A 2.39± 0.58	A 2.39± 0.50	A 2.53± 0.59	0.69
Group eleven No. (5)	S.Na	A 143.20± 1.30	BA 142.40±1.14	B 141.00± 1.01	*1.59
	S.K	A 4.40± 0.25	A 4.40± 0.12	A 4.50± 0.16	0.26
	S.Ca	A 2.45± 0.23	A 2.62± 0.22	A 2.50± 0.20	0.30

Table 6:The means of serum (BU) mmol/L, (Cr) Mmol/L , (UA)Mmol/L levels in patients with EHT throughout the four weeks of treatment by different regimens of drugs in groups (1,2,3,4,6) plus (NS) or treatment with (NS) alone in group (12).

Group No.		Before treatment	After two weeks of treatment plus (NS)	After four weeks of treatment plus (NS)	LSD
Group one No.(6)	S.BU	A 4.29± 0.52	A 4.17± 0.45	A 3.99± 0.43	0.57
	S.Cr	A 98.33± 7.53	A 95.92± 5.44	A 91.67± 5.89	7.81
	S.UA	A 395.67± 21.83	A 384.20± 20.88	A371.50 ±25.01	27.86
Group two No.(6)	S.BU	A 3.77± 0.29	A 3.60± 0.27	A 3.45± 0.32	0.36
	S.Cr	A 71.67± 6.89	A 67.50± 5.13	A 66.00±3.22	6.52
	S.UA	A 227.33± 35.80	A 217.67± 35.17	A 207.00±31.74	42.19
Group three No.(6)	S.BU	A 3.38± 0.96	A 3.15± 0.67	A 3.00±0.64	0.95
	S.Cr	A 84.33± 17.25	A 82.00± 14.39	A 78.00±10.06	17.49
	S.UA	A 309.17± 46.44	A 282.66± 50.58	A 284.17±42.15	57.27
Group four No.(5)	S.BU	A 6.11±0.52	BA 5.82± 0.50	B 5.30± 0.49	*0.70
	S.Cr	A 89.00± 7.42	A 86.00± 8.92	A 82.00± 10.46	12.43
	S.UA	A 218.00± 58.37	A 204.60± 47.69	A 197.60± 47.41	70.85
Group six No.(6)	S.BU	A 3.30± 0.23	A 3.26± 0.28	A 3.00± 0.32	0.34
	S.Cr	A 76.83± 7.47	A 74.17± 5.78	A 70.83± 4.45	7.41
	S.UA	A 217.33± 35.06	A 214.50± 33.95	A 211.00± 38.57	44.20
Group twelve No.(5)	S.BU	A 3.70± 0.89	A 3.55± 0.87	A 3.40± 0.91	1.23
	S.Cr	A 67.60± 4.51	BA 65.20± 4.15	B 62.20± 2.68	*5.32
	S.UA	A 228.80± 75.59	A 212.60± 72.27	A 201.00± 66.75	98.70

Table 6: The means of serum (Na,K,Ca) mmol/L levels in patients with EHT throughout the four weeks of treatment by different regimens of drugs in groups (1,2,3,4,6,12) plus (NS)or treatment with (NS) alone in group (12).

Group No.		Before treatment	After two weeks of treatment plus (NS)	After four weeks of treatment plus (NS)	LSD
Group one No.(6)	S.Na	A 139.83± 2.56	A 139.79± 2.56	A 138.70± 3.19	3.43
	S.K	A 4.47± 0.36	A 4.53± 0.43	A 4.56± 0.41	0.50
	S.Ca	A 1.51± 0.43	A 1.47± 0.44	A 1.42± 0.45	0.54
Group two No.(6)	S.Na	A 140.33± 2.88	A 140.17± 1.47	A 140.03± 1.82	2.64
	S.K	A 4.35± 0.21	A 4.39± 0.23	A 4.50± 0.25	0.28
	S.Ca	A 1.82± 0.23	A 1.78± 0.20	A 1.74± 0.18	0.26
Group three No. (6)	S.Na	A 142.82± 1.10	A 142.77± 1.08	A 142.63± 1.15	1.37
	S.K	B 4.33± 0.11	BA 4.40± 0.11	A 4.47± 0.09	*0.13
	S.Ca	A 2.82± 0.45	BA 2.58± 0.41	B 2.21± 0.37	*0.51
Group four No. (5)	S.Na	A 141.40± 2.30	A 141.18± 2.34	A 140.20± 2.34	3.20
	S.K	A4.71± 0.54	A 4.76± 0.54	A 4.90± 0.50	0.72
	S.Ca	A 2.28± 0.47	A 2.25± 0.46	A 2.20 ± 2.29	0.57
Group six No.(6)	S.Na	A 141.17± 1.17	BA 140.50 ± 1.22	B 139.20± 1.32	*1.53
	S.K	B 4.13± 0.05	B4.25± 0.05	A 4.47± 0.16	**0.13
	S.Ca	A 2.32± 0.38	A 2.29± 0.39	A 2.24± 0.32	0.45
Group twelve No.(5)	S.Na	A 142.06± 0.93	A 141.20± 0.84	A 141.00± 2.65	2.33
	S.K	B 4.40± 0.34	B4.40± 0.21	A 5.00± 0.14	**0.34
	S.Ca	A 2.48± 0.25	A 2.44± 0.09	A 2.40± 0.13	0.23

Table 6: The means of serum (BU) mmol/L, (Cr) Mmol/L , (UA)Mmol/L levels in patients with EHT throughout the four weeks of treatment by different regimens of drugs in groups (4,6,7,10) plus (HS) or treatment with (HS) alone in group (13).

Group No.		Before treatment	After two weeks of treatment plus (HS)	After four weeks of treatment plus (HS)	LSD
Group four No.(6)	S.BU	A 5.18± 1.06	A 5.00± 1.04	A 4.72± 0.98	1.27
	S.Cr	A 81.83± 7.63	A 79.83± 8.42	A 75.50± 8.67	10.51
	S.UA	A 251.17± 51.16	A 249.00± 51.93	A 245.33± 44.84	60.81
Group six No.(6)	S.BU	A 3.16± 0.15	B 2.81± 0.13	C 2.56± 0.09	**0.15
	S.Cr	A 78.67± 13.09	A 77.83± 12.35	A 76.00± 10.51	14.81
	S.UA	A 215.17± 39.73	A 211.83± 39.76	A 211.00± 37.09	47.84
Group seven No.(6)	S.BU	A 2.42± 0.60	A 2.23± 0.60	A 2.00± 0.63	0.75
	S.Cr	A 66.00 5.55	A63.67± 3.83	A 61.33±3.50	5.40
	S.UA	A 265.50± 26.13	A 261.50± 28.40	A 259.00± 27.09	33.50
Group ten No.(7)	S.BU	A 3.46± 0.74	A 3.15± 0.13	A 3.00± 0.19	0.55
	S.Cr	A 63.83± 3.87	A 60.00± 3.90	A 59.00± 5.70	5.62
	S.UA	A 326.50± 24.62	A 323.00± 23.77	A 315.33± 25.30	30.24
Group thirteen No.(5)	S.BU	A 3.00± 0.26	BA 2.84± 0.23	B 2.54± 0.23	*0.33
	S.Cr	A 84.64± 8.16	A 83.20± 8.87	A 80.40± 7.30	11.21
	S.UA	A 312.00± 66.77	A 307.00± 59.40	A 305.60± 54.95	83.47

Table 6: The means of serum (Na,K,Ca) mmol/L levels in patients with EHT throughout the four weeks of treatment by different regimens of drugs in groups (4,6,7,10) plus (HS) or treatment with (HS) alone in group (13).

Group No.		Before treatment	After two weeks of treatment plus (HS)	After four weeks of treatment plus (HS)	LSD
Group four No.(6)	S.Na	A 142.67± 2.42	A 141.90± 1.77	A 140.39± 1.27	2.32
	S.K	A 4.71± 0.40	A 4.71± 0.44	A 4.69± 0.39	0.50
	S.Ca	A 2.15± 0.45	A 2.12± 0.53	A 2.19± 0.65	0.68
Group six No.(6)	S.Na	A 141.50± 1.05	B 139.00± 2.00	B 138.83± 1.60	*1.97
	S.K	A 4.05± 0.05	A 4.01± 0.05	A 4.00± 0.40	0.29
	S.Ca	A 2.06± 0.48	A 2.04± 0.47	A 2.10± 0.47	0.58
Group seven No. (6)	S.Na	A 139.17± 1.60	A 138.17± 1.67	B 136.00± 1.51	*1.96
	S.K	A 4.62± 0.48	A 4.60± 0.44	A 4.57± 0.44	0.55
	S.Ca	A 1.98± 0.04	A 1.99± 0.05	A 2.01± 0.06	0.07
Group ten No.(7)	S.Na	A 141.17± 0.98	BA 140.17± 0.75	B 139.00± 1.41	*1.34
	S.K	A 4.20± 0.17	A 4.20± 0.24	A 4.17± 0.23	0.26
	S.Ca	A 2.32± 0.17	A 2.27± 0.19	A 2.35± 0.14	0.21
Group thirteen No.(5)	S.Na	A 140.42± 0.58	A 140.00± 2.45	A 138.00± 2.45	2.79
	S.K	A 4.06± 0.09	A 4.02± 0.11	A 4.02± 0.04	0.12
	S.Ca	A 2.40± 0.16	A 2.40± 0.12	A 2.50± 0.14	0.20

Table 7: The means of arterial blood pressure levels (systolic and diastolic) mm Hg in patients with EHT throughout the four weeks of treatment by Garlic (G), *Nigella sativa* (NS), *Hibiscus sabdariffa* (HS) in groups (11,12,13).

Period	Group eleven (G) No.5		Group twelve (*NS*) No.5		Group thirteen (*HS*) No.5	
	Systolic	Diastolic	Systolic	Diastolic	Systolic	Diastolic
Before Treatment	A	BA	A	A	A	A
	145.00	94.00	146.00	95.00	162.00	104.00
	±	±	±	±	±	±
	7.07	4.18	10.84	3.54	7.58	5.48
After one week of treatment by plants alone	A	A	A	A	B	A
	144.40	96.00	150.00	95.00	144.00	100.60
	±	±	±	±	±	±
	6.07	2.34	6.12	3.54	8.94	5.64
After two weeks of treatment by plants alone	BA	B	A	A	C	A
	136.00	92.00	144.00	95.00	134.00	102.20
	±	±	±	±	±	±
	8.94	2.74	4.18	3.53	8.94	3.19
After three weeks of treatment by plants alone	BC	C	BA	A	CB	B
	133.00	86.00	142.00	95.00	135.00	90.00
	±	±	±	±	±	±
	7.58	2.24	4.47	3.54	6.12	3.54
After four weeks of treatment by plants alone	C	C	B	B	C	C
	125.00	84.00	135.00	75.00	130.00	84.00
	±	±	±	±	±	±
	7.07	2.24	6.12	5.00	3.54	4.18
LSD	**	**	*	**	**	**
	9.77	3.73	8.95	5.11	9.65	5.96

DISCUSSION

In present study different regimens of antihypertensive drugs and medicinal plants were used to treat patients with moderate to severe EHT then reach to the normal level of BP. Ramipril induced a strong and sustained inhibition of plasma angiotensin converting enzyme activity (13) , It was used and produced a significant reduction in BP groups (1,5) as a result of (25) to evaluate the effects on nitric oxide dependent vasodilatation with EHT, or increase of bradykinin (18) or reduce of plasma leptin and also to increase in adiponectin level after administration of 10mg ramipril (23) . Calcium channel blocker (CCB) amlodipine used to treat patients with moderate to severe EHT groups (2,3), amlodipine may exert antioxidant action by decreasing malondiahyde (MDA) and increase in the superoxide dismutase levels (SOD) that may be helpful in the release of nitric oxide (NO) (26) . Valsartan in two doses groups (4, 6) reduced EHT to mild hypertension after four weeks of treatment while other study

demonstrated that hypertension with mild to moderate stages were treated by 80-160mg / day need about 3-6 and more 8 weeks respectively to reach < 140 / 90 mmHg, so our result may be related to high response to the drug or to the individual variations. The significant reduction in EHT levels of some obese patients groups (4, 6) valsartan caused reduction in plasma leptin and insulin resistance (16) .

In the present study the target BP levels was not achieved after few days of therapy with one or two drugs in groups (1, 7, 8, 9, 10) but after treatment by combination of drugs there was a greater reduction in systolic and diastolic blood pressure levels as compared with monotherapy by improvement of antihypertensive drugs efficacy which result from dual mechanistic action of component that targeting different effector mechanism (8) . Combination of valsartan with amlodipine provided greater reduction in BP than monotherapy (19) . Amlodipine alone caused an increase in nor- epinephrine then increase peripheral sympathetic basal tone but the hypotensive effect of valsartan maybe mediated in part by inhibition of the sympathetic baroreflex in hypertensive patients (11) .

There was a significant reduction in arterial blood pressure after using G alone or in combination with drugs to treat patients with mild to moderate EHT groups (1, 2, 3, 5, 7, 8, 9, 11) by it possible hypotensive mechanisms as prostaglandin which decrease peripheral vascular resistance (35) or increase the production of nitric oxide (6) (32) , also exert an indirect vasodilator by hydrogen sulphide synthesis which is a potent vasodilator (27) , or G ability to inhibit angiotensin converting enzyme in vitro (39) (34) , or reducting intracellular Na concentration and normalized blood pressure (5) .

In this current study NS produced a significant lowering in EHT when used it alone or in combination with drugs to treat EHT groups (1, 2, 3, 4, 6, 12) this may related to its antioxidant activity (22) , it decrease the arterial blood pressure and heart rate (42) or may to the diuretic effect (47). HS is used to treat the patients in groups (4, 6, 7, 10, 13) cause a significant reduction in EHT because HS is consider as a strong antihypertensive agent in man & rat (4) which cause inhibition of angiotensin I and angiotensin II converting enzyme (24) or diuretic effect (45) and potassium acetate contained in its water extract which has a moderate diuretic effect , inhibit calcium influx into vascular smooth muscle (3) or related to decrease in heart rate and suggests a negative chronotropic action (31).

A comparison can be made between the results of (G, NS, HS) when used alone, HS has the more potent effect on systolic pressure levels than G and NS while HS and NS have an equal effect on diastolic pressure levels but more than that of G Table (7).

Effects of drugs and plants on renal functions

After treatment with ramipril in group (5) there was a significant elevation in serum BU and Na levels but remain within the normal range, continuous administration of the drug for longer period produced a decrease in serum BU that consistent to the result obtained by (28) who found in their experimental study that treatment with ramipril for produce increase in serum BU with references range.

Treatment with amlodipine group (2) produced no significant change in serum BU because amlodipine has no significant effect on the serum BU (2) but treatment with amlodipine 10mg group (3) caused a significant reduction in serum BU level.

Treatment with valsartan group (4) produced a significant decrease in the serum Cr level while other studies revealed that valsartan has no significant effect on the serum Cr (30) . Administration of valsartan group (6) caused a significant reduction in serum UA level because it could inhibit the renal uric acid transport Organic anion trans porter mediated uric acid secretion (38) . Using a combination of drugs group (1) caused a significant decrease in serum BU level may be by synergistic effect of both drugs that exert renal protection.

After treatment by amlodipine, valsartan, metoprolol group (7) there was a significant decrease in serum BU, Cr levels may be due to the effects of these drugs and decrease in serum UA level may be related to the diet of patients and elevation in serum K level may be due to the effect of metoprolol and amlodipine, the reduction in serum Ca level due to the synergistic effect of combination. Treatment with combination of valsartan, amlodipine, metoprolol group (8) caused a significant reduction in serum BU, Cr levels may be related to the synergistic effect of these drugs, reduction in serum K level may be due to the effect of amlodipine and valsartan. Combination of amlodipine, metoprolol group (9) lead to a significant reduction in serum Ca level due to the effect of both drugs while in group (10) using amlodipine and metoprolol caused a significant reduction of serum BU, Cr, elevation in UA this may be related to the effects of drugs. Using garlic alone or with

drugs caused a significant decrease in serum Cr groups (2, 5, 7, 8, 11) and BU, UA groups (7, 11). Garlic imply that could be beneficial to improve some renal functions by its antioxidant properties and free radical scavenging abilities in various diseases (43) , (12) also a significant reduction in serum Na level groups (1, 3, 5, 7, 8, 9, 11) may be related to synergistic effects of garlic and different drugs, indicating that garlic is useful in the management of electrolytes related disorders (1) and a significant increase in serum K levels groups (7, 9).

Treatment by NS, HS alone or in combination cause no significant improvement in renal functions levels in most groups may due to normal levels or small doses and short time of treatment.

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