RESULTS

This study included 60 patients with essential hypertension 32 females and 28 males, their age ranged 43:59 years (Mean 52 ± 4 years). A control group included 20 of age and sex matched healthy subjects was also included in the study.

As shown in (Table I) there is no statistically significant difference between both studied groups (patients and control) as regard clinical data.

Ambulatory blood pressure readings showed statistically significant difference between both groups (patients and control) in day time, night time and average 24-h blood pressure ($P < 0.01$) (Tables 2,3,4) and Figures (1,2, 3).

Both groups (patients and control) were studied as regard the presence of dippers there was statistically significant difference between both groups. The prevalence of dippers among control group (80%) was more than that among patients (56.6%) (Table 5) and Figure (4).

Hyperdippers (subjects whose night time blood pressure was reduced by ≥ 20% in comparison to their day time blood pressure) were not present in both groups (patients and control).

As shown in (Table 6) there were statistically significant difference in echocardiographic parameters between both groups except "LVEDD".

Table (1): Comparative analysis of clinical parameters in hypertensives versus normotensives.

Parameter	Patients (n =60) $\bar{x}$ ± SD	Control (n = 20) $\bar{x}$ ± SD	t	P	Sig.
Age (years)	52.0 ± 4.0	50.3 ± 4.5	1.614	>0.05	NS
Weight (kg)	80.5 ± 9.6	78.6 ± 7.3	0.810	>0.05	NS
Height (cm)	168.5 ± 8.6	164.6 ± 6.5	1.863	>0.05	NS
BSA (M^2)	1.9 ± 1.13	1.8 ± 0.1	1.349	>0.05	NS
BMI (kg/M^2)	28.5 ± 3.9	29.2 ± 3.8	0.676	>0.05	NS

X = mean SD = standard deviation

BSA = body surface area NS = non significant

BMI = Body mass index

Table (2): Comparative analysis of ambulatory blood pressure readings in hypertensives versus normotensives as regards day time.

Parameter	Patients (n =60) $\bar{x}$ ± SD	Control (n = 20) $\bar{x}$ ± SD	t	P	Sig.
TAG (1) BP:					
Average systolic	172.2 ± 15.1	138.2 ± 12.8	11.125	< 0.01	HS
Average diastolic	103.4 ± 7.8	89.5 ± 5.0	7.464	< 0.01	HS
Average mean	124.8 ± 15.5	105.7 ± 8.9	5.910	< 0.01	HS
TAG (2) BP:					
Average systolic	167.0 ± 16.2	122.3 ± 4.7	12.147	< 0.01	HS
Average diastolic	95.9 ± 5.7	80.2 ± 5.4	10.808	< 0.01	HS
Average mean	116.8 ± 12.6	94.6 ± 3.7	7.800	< 0.01	HS
TAG (3) BP:					
Average systolic	163.5 ± 18.7	121.9 ± 3.7	9.871	< 0.01	HS
Average diastolic	93.6 ± 4.4	78.3 ± 5.0	13.085	< 0.01	HS
Average mean	113.4 ± 12.2	92.4 ± 2.8	7.567	< 0.01	HS

TAG (1) = Time period starting from arising time → 10 AM.

TAG (2) = Time period starting from 10 AM → 7 PM

TAG (3) = Time period starting from 7 PM → sleep time

HS = Highly significant

Fig. (1): **Ambulatory (BP) in hypertensives versus normotensives (in day time).**

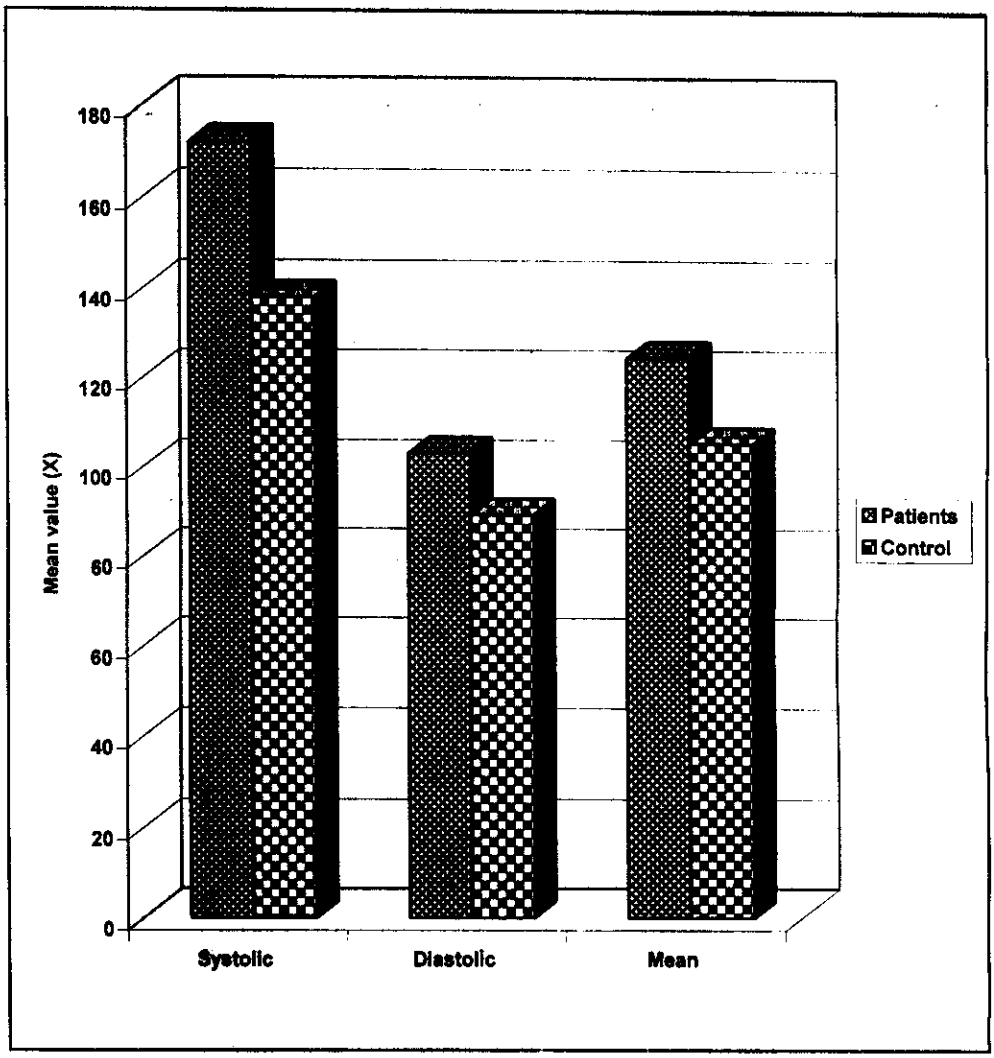


Table (3): Comparative analysis of ambulatory blood pressure readings in hypertensives versus normotensives as regards (night time).

Parameter	Patients (n =60) $\bar{x}$ ± SD	Control (n = 20) $\bar{x}$ ± SD	t	P	Sig.
Night time BP:					
Average systolic	162.2 ± 21.4	106.2 ± 5.0	8.152	<0.01	HS
Average diastolic	89.6 ± 6.9	70.6 ± 6.2	9.119	<0.01	HS
Average mean	109.2 ± 13.5	80.5 ± 3.3	6.099	<0.01	HS

HS = Highly significant

Fig. (2): **Ambulatory blood pressure in hypertenstives versus normotensives in (night time).**

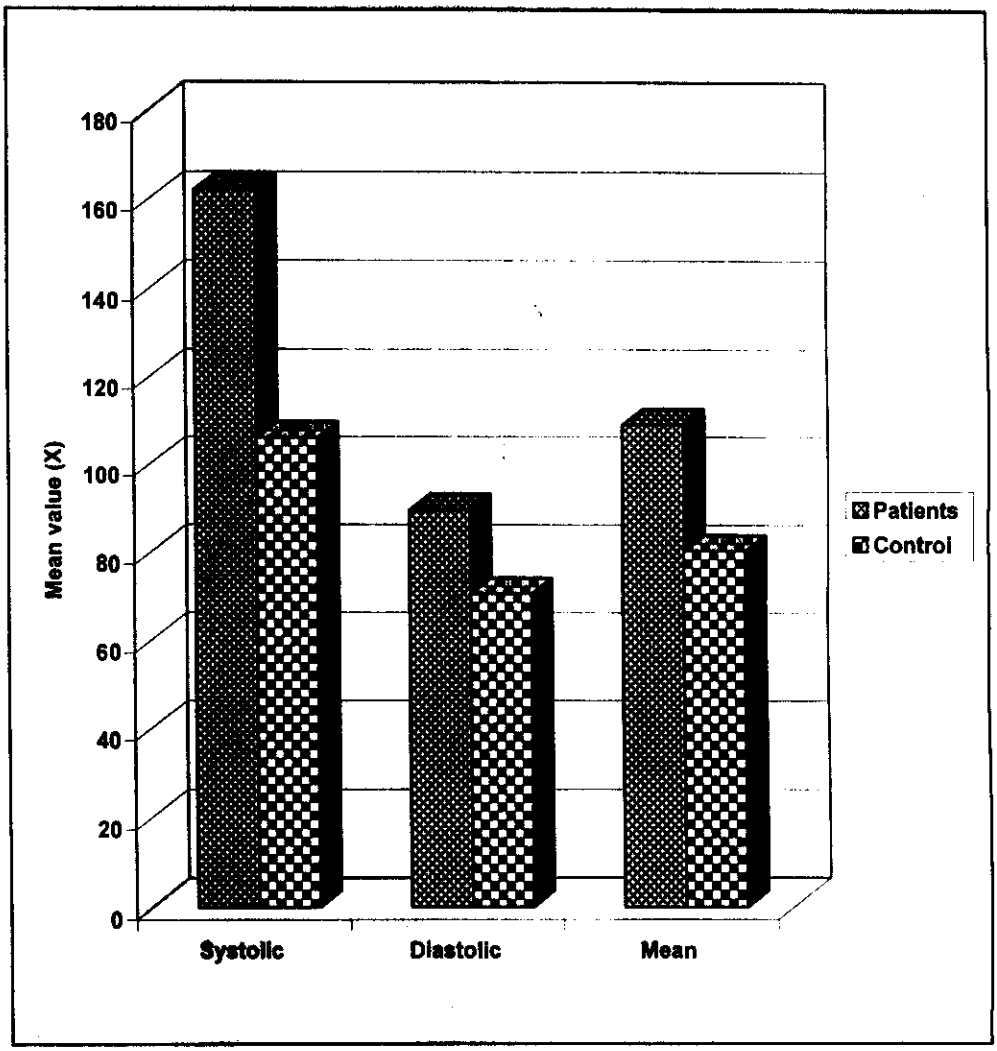


Table (4): Comparative analysis of ambulatory blood pressure readings in hypertensives versus normotensives as regard (average 24 h blood pressure).

Parameter	Patients (n =60) $\bar{x}$ ± SD	Control (n = 20) $\bar{x}$ ± SD	t	P	Sig.
Average 24 h BP:					
Average systolic	165.9 ± 16.2	123.9 ± 4.1	11.434	<0.01	HS
Average diastolic	96.7 ± 5.0	80.4 ± 4.0	12.480	<0.01	HS
Average mean	116.0 ± 12.1	95.8 ± 3.6	7.332	<0.01	HS

HS = Highly significant.

Fig. (3): **Ambulatory blood pressure in hypertensives versus normotensives (through out 24 hours)**

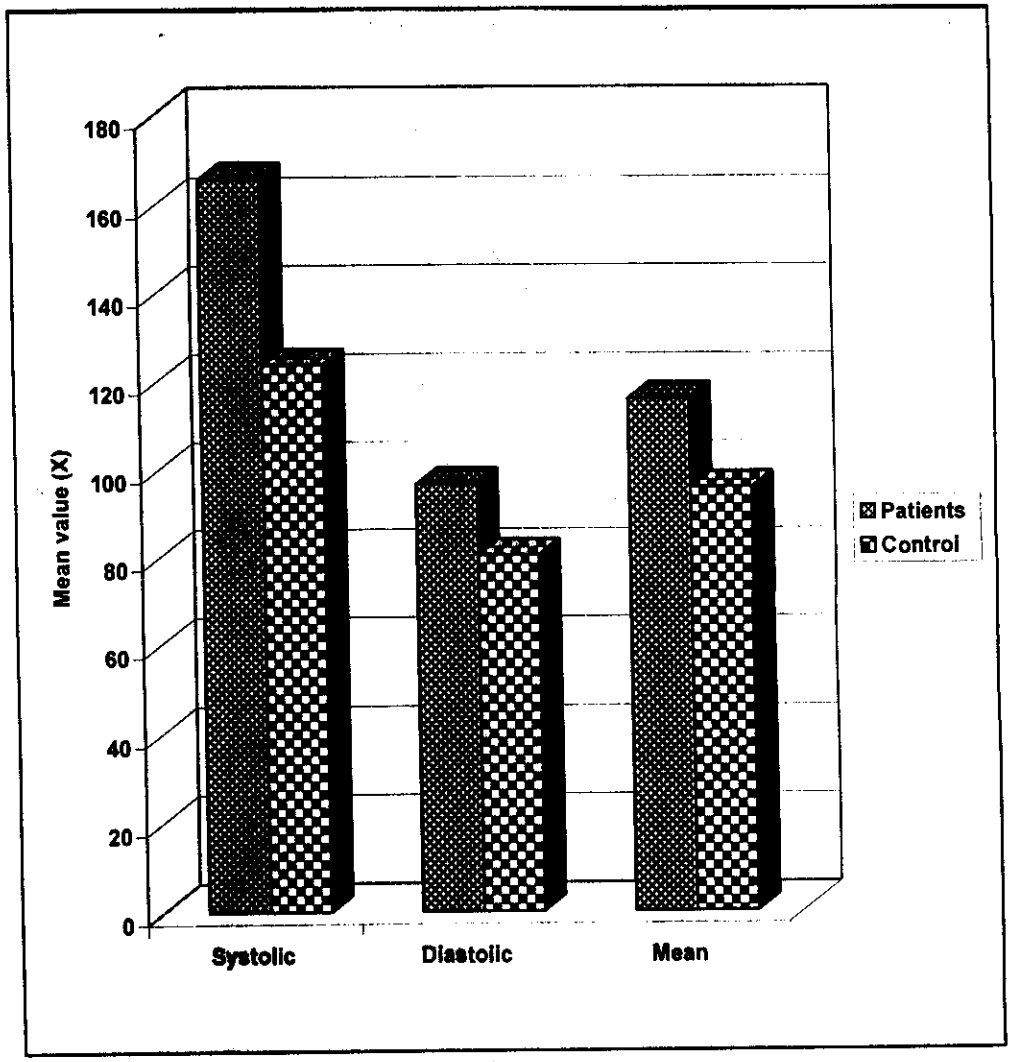


Table (5): Prevalence of dippers and non dippers among hypertensives versus normotensives.

Parameter	Patients (n = 60)		Control (n = 20)	
	No.	%	No.	%
Dippers	34	56.67	16	80
Non dippers	26	43.33	4	20
Total	60	100.0	20	100.0

$X^2 = 3.984$ $P < 0.05$

Fig. (4): **The prevalence of dippers and non dippers among hypertensives versus normotensives.**

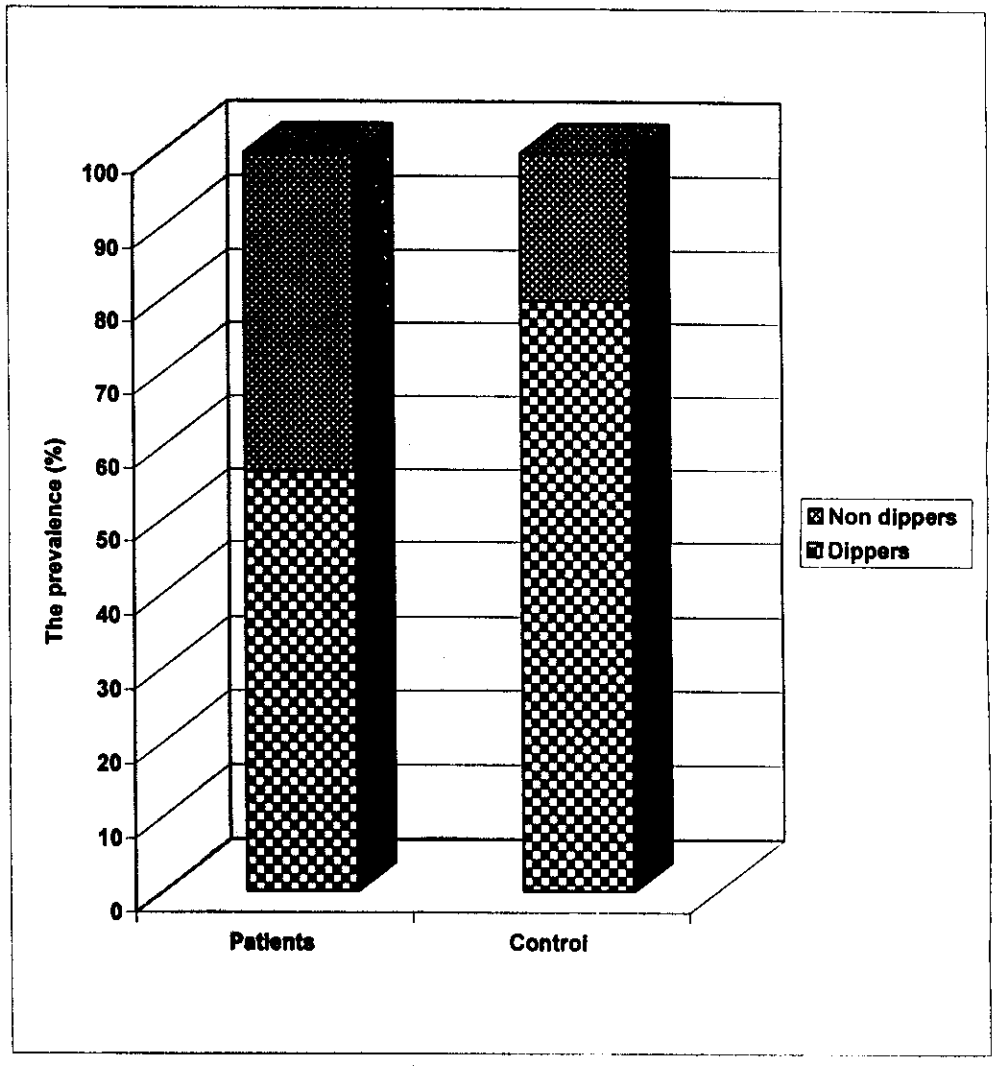


Table (6): Comparative analysis of echocardiographic parameters in hypertensives versus normotensives.

Parameter	Patients (n =60) $\bar{x}$ ± SD	Control (n = 20) $\bar{x}$ ± SD	t	P	Sig.
LVEDD (cm)	4.74 ± 0.45	4.65 ± 0.45	0.799	>0.05	NS
PWTd (cm)	1.20 ± 0.20	0.80 ± 0.10	6.599	<0.01	HS
SWTd (cm)	1.30 ± 0.30	0.80 ± 0.20	5.559	<0.01	HS
LVMI penn (g/m^2)	122.4 ± 39.8	61.3 ± 14.6	6.683	<0.01	HS

NS = Non significant

HS = Highly significant

LVEDD = Left ventricular end diastolic dimension

PWTd = Posterior wall thickness in diastole

SWTd = Septal wall thickness in diastole

LVMI penn (g/m^2) = Left ventricular mass index.

When hypertensive patients were classified according to the presence or absence of echo-evident left ventricular hypertrophy there were statistically significant difference between both subgroups as regard clinical parameters except height (Table 7).

In comparison between patients with LVH and patients without LVH as regard casual blood pressure and ambulatory blood pressure readings (Tables 8, 9, 10) and Figures (5, 6, 7,8). There were no statistically significant difference between both studied groups in casual blood pressure and day time ambulatory diastolic blood pressure but there were statistically significant difference in other ambulatory blood pressure readings in day, night and average 24-h blood pressure values.

Hypertensive patients were studied as regard the presence of dippers. There was that only (10 out of 32) patients with LVH (31.25%) were found to be dippers while (24 out of 28) patients without LVH (85.71%) were found to be dippers.

Hyperdippers were not found among both hypertensive groups (with LVH, without LVH).

As shown in (Table 12) hypertensive patients were classified as regard to night fall of blood pressure into (dippers and non dippers) there was no statistically significant difference between both groups as regard age and duration of hypertension.

Table (7): Comparative analysis of clinical parameters in hypertensives with "LVH" versus hypertensives without "LVH".

Parameter	With LVH (n =32) $\bar{x} \pm SD$	Without LVH (n = 28) $\bar{x} \pm SD$	t	P	Sig.
Age (years)	55.1 ± 2.1	48.5 ± 2.5	11.137	<0.01	HS
Weight (kg)	82.8 ± 9.8	77.8 ± 8.6	2.084	<0.05	S
Height (cm)	170.03 ± 8.74	166.82 ± 8.34	1.450	>0.05	NS
BSA (M^2)	1.92 ± 0.14	1.86 ± 0.12	1.976	<0.05	S
BMI (kg/M^2)	29.7 ± 4.1	28.2 ± 3.8	1.985	<0.05	S

LVH = Left ventricular hypertrophy

BSA = Body surface area

BMI = Body mass index

HS = Highly significant

S = Significant

NS = Non significant

Table (8): Comparative analysis of casual and average 24-h ambulatory blood pressure readings in hypertensives with LVH versus hypertensives without LVH.

Parameter	With LVH (n =32) $\bar{x}$ ± SD	Without LVH (n=28) $\bar{x}$ ± SD	t	P	Sig.
Casual BP:					
Systolic	168.59 ± 10.57	169.82 ± 11.26	0.436	>0.05	NS
Diastolic	105.16 ± 6.57	103.0 ± 6.39	1.054	>0.05	NS
Mean	124.7 ± 7.7	122.3 ± 8.1	1.033	>0.05	NS
Average 24-h (ABPM):					
Average systolic	172.5 ± 14.7	150.3 ± 14.5	3.761	<0.05	S
Average diastolic	105.1 ± 3.4	92.0 ± 5.9	2.541	<0.05	S
Average mean	120.2 ± 10.1	101.3 ± 12.6	3.039	<0.05	S

ABPM = Ambulatory blood pressure monitoring.

NS = Non significant

S = Significant

LVH = Left ventricular hypertrophy

Fig. (5): **Causal blood pressure readings in hypertensive patients (with LVH and without LVH)**

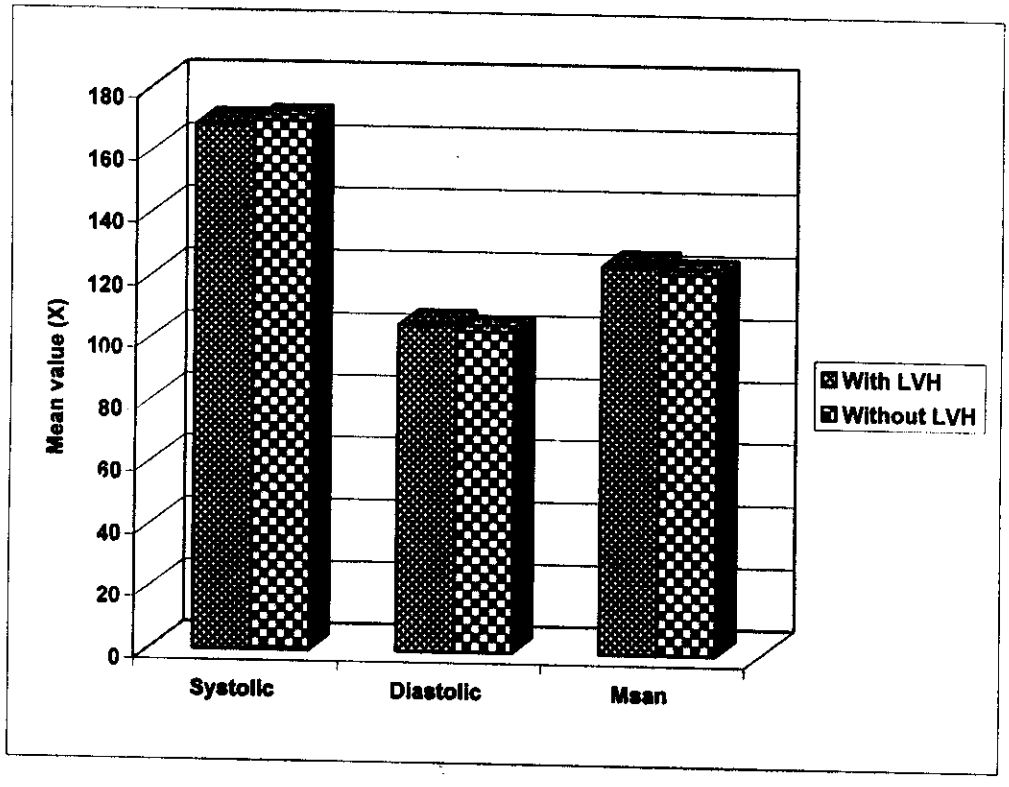


Fig. (6): **Ambulatory blood pressure readings (in 24-h) in hypertensive patients (with LVH and without LVH)**

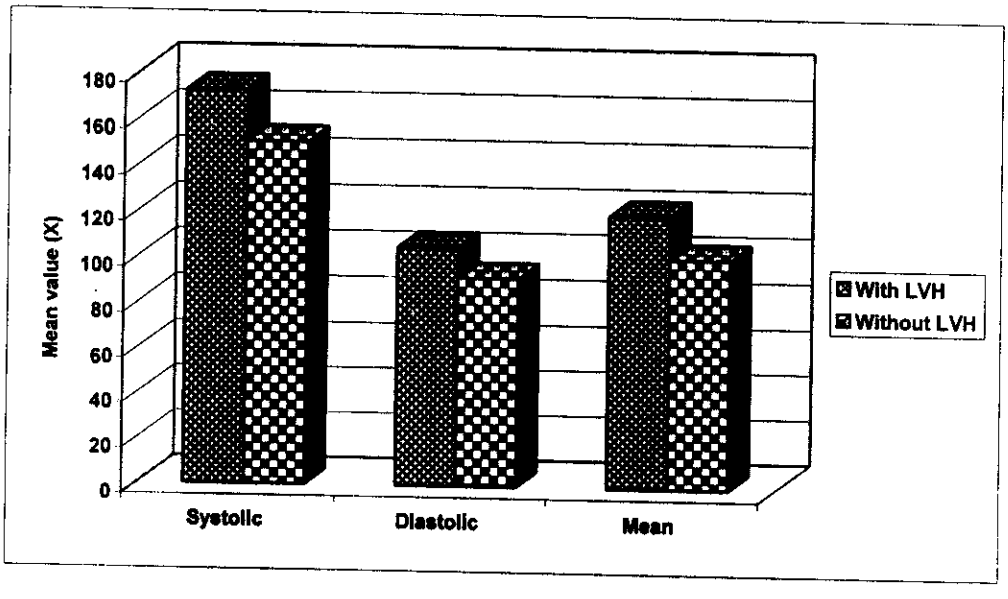


Table (9): Comparative analysis of ambulatory blood pressure readings (day time) in hypertensives with LVH versus hypertensives without LVH.

Parameter	With LVH (n =32) $\bar{x}$ ± SD	Without LVH (n = 28) $\bar{x}$ ± SD	t	P	Sig.
TAG (1) BP:					
Average systolic	191.6 ± 17.2	168.2 ± 10.7	2.505	<0.05	S
Average diastolic	106.63 ± 8.4	103 ± 7.12	0.128	>0.05	NS
Average mean	138.4 ± 13.9	116.8 ± 16.6	1.968	<0.05	S
TAG (2) BP:					
Average systolic	172.4 ± 15.0	160.9 ± 15.5	2.915	<0.05	S
Average diastolic	107.0 ± 4.8	94.8 ± 6.5	1.487	>0.05	NS
Average mean	120.4 ± 11.1	112.6 ± 12.8	2.545	<0.05	S
TAG (3) BP:					
Average systolic	170.3 ± 17.6	155.8 ± 17.0	3.223	<0.05	S
Average diastolic	105.0 ± 3.3	93.1 ± 3.7	1.954	>0.05	NS
Average mean	117.1 ± 11.4	109.2 ± 12.0	2.586	<0.05	S

TAG (1) = Time period starting from arising time → 10 AM

TAG (2) = Time period starting from 10 AM → 7 PM

TAG (3) = Time period starting from 7 PM → sleep time

S = Significant

NS = Non-significant

Fig. (7): **Ambulatory (systolic, diastolic and mean BP) in hypertensive patients (in day time)**

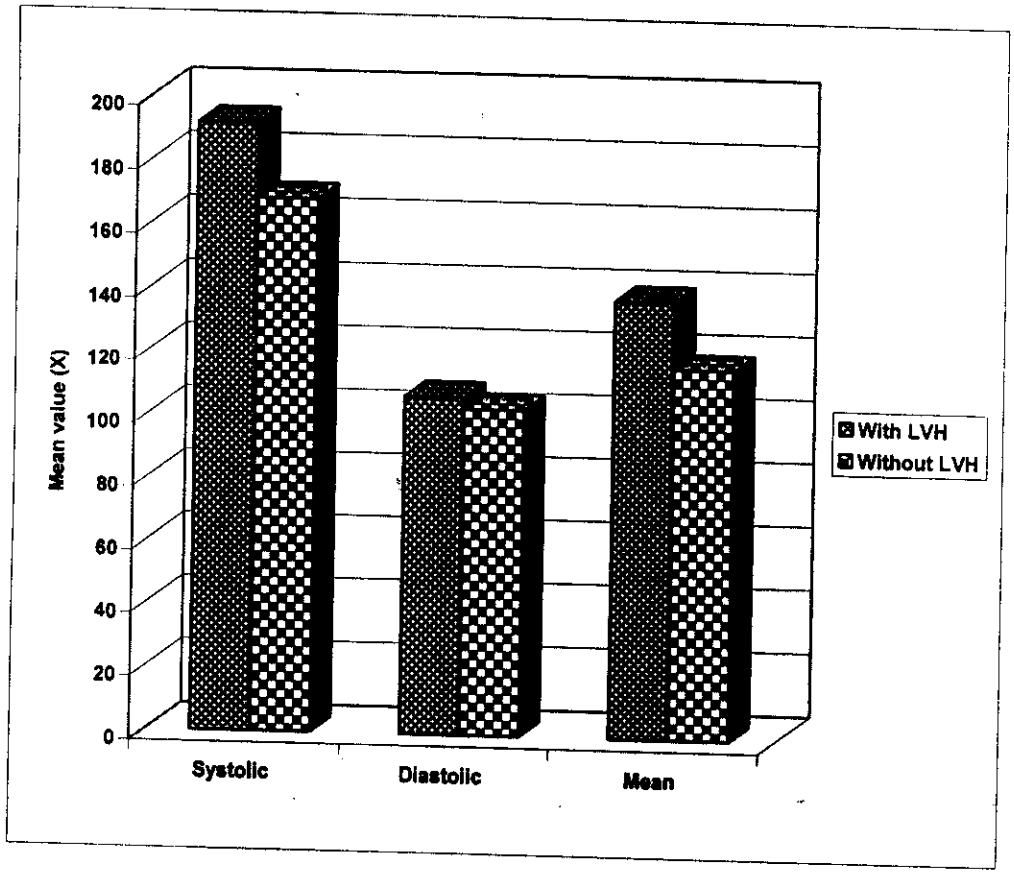


Table (10): Comparative analysis of ambulatory blood pressure readings (night time) in hypertensives with LVH versus hypertensives without LVH.

Parameter	With LVH (n =32) $\bar{x}$ ± SD	Without LVH (n = 28) $\bar{x}$ ± SD	t	P	Sig.
Night time BP:					
Average systolic	169.9 ± 18.0	144.3 ± 19.4	4.480	<0.01	HS
Average diastolic	102.9 ± 3.9	85.8 ± 7.8	4.510	<0.01	HS
Average mean	124.9 ± 11.0	102.5 ± 13.2	3.964	<0.05	S

Night time = actual sleep period starting from sleep time→ arising time.

HS = Highly significant

S = Significant

Fig. (8): **Ambulatory (systolic, diastolic and mean BP) in hypertensive patients (in night time)**

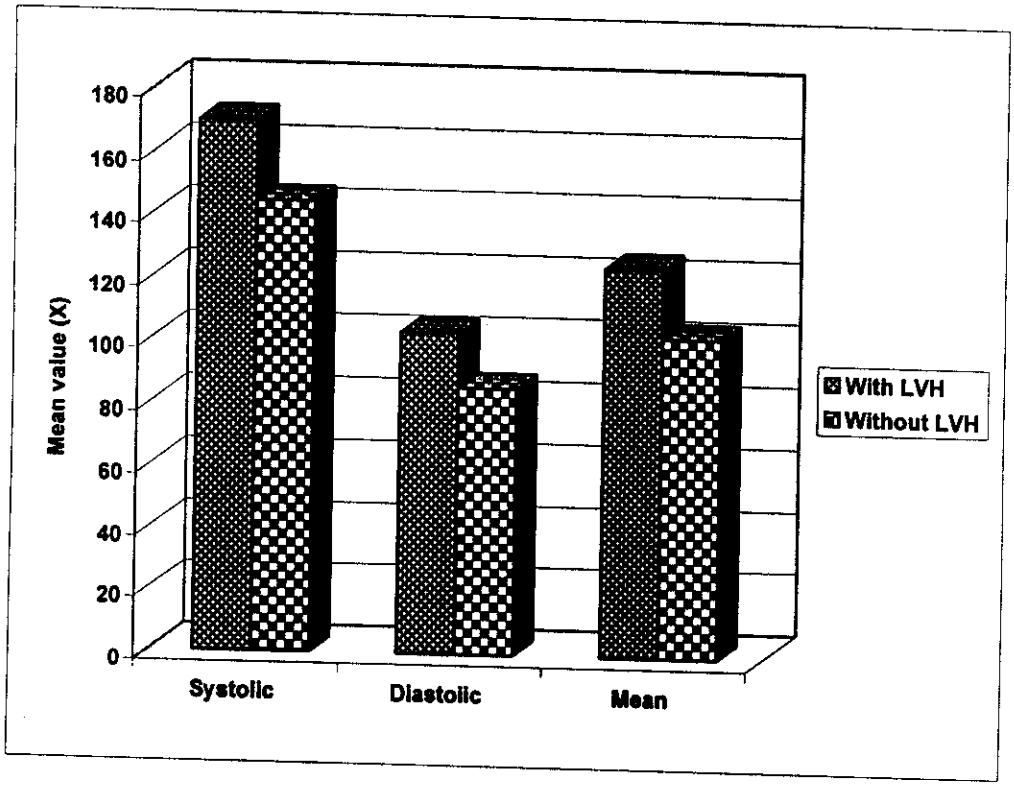


Table (11): Prevalence of dippers and non dippers among hypertensives with LVH versus hypertensives without LVH.

Parameter	With LVH		Without LVH		Total	
	No.	%	No.	%	No.	%
Dippers	10	31.25	24	85.71	34	56.67
Non dippers	22	68.75	4	14.29	26	43.33
Total	32	100.0	28	100.0	60	100.0

$X^2 = 18.040$ $P < 0.05$

LVH = Left ventricular hypertrophy.

Fig. (9): **The prevalence of dippers and non dippers among hypertensive patients.**

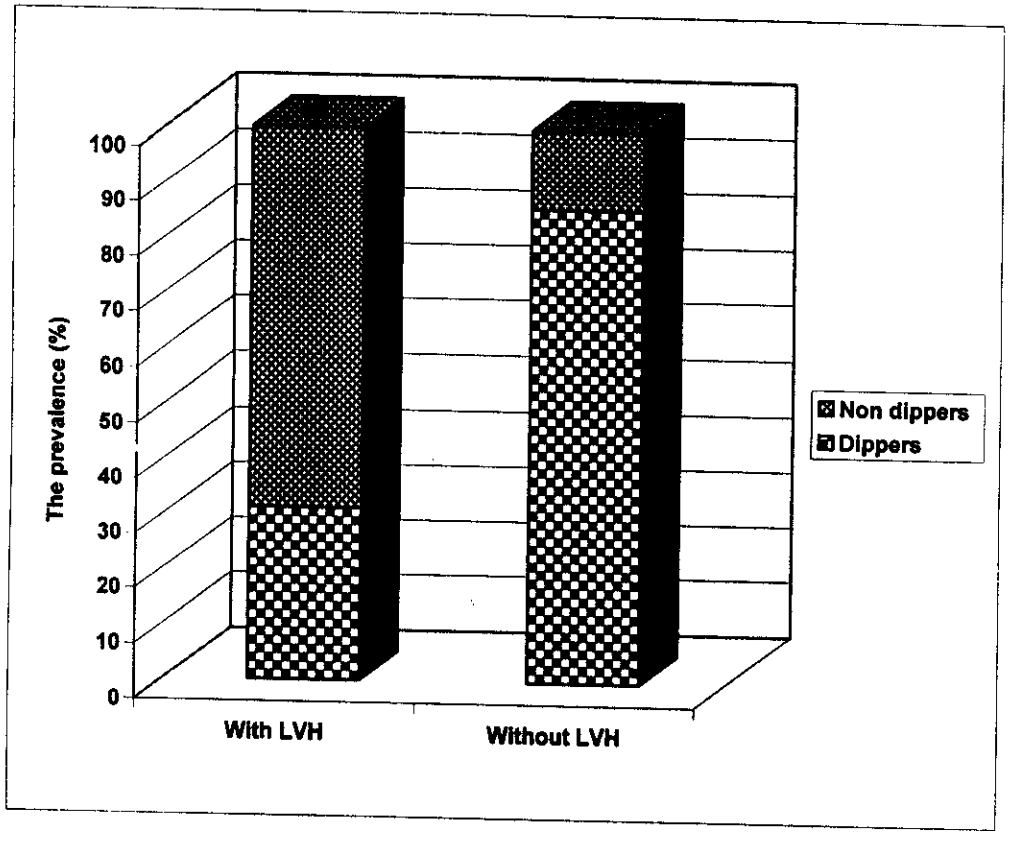


Table (12): Comparison between dippers and non dippers among hypertensive patients as regard age.

Parameter	Dippers (n = 34) $\bar{x}$ ± SD	Non dippers (n =26) $\bar{x}$ ± SD	t	P	Sig.
Age (in years)	51.8 ± 4.0	52.2 ± 2.9	1.66	>0.05	NS

NS = Non significant

As shown in (Table 13) there was no significant correlation between left ventricular mass index (LVMI) and height while LVMI showed a significant correlation with other parameters ($P < 0.05$).

As shown in (Table 14) and Figures (10, 11, 12, 13) there was significant correlation between (LVMI) and mean of ambulatory blood pressure readings in different times (day time, night time and average 24 h BP) "$P < 0.05$". But there was no significant correlation between left ventricular mass index (LVMI) and casual blood pressure readings.

Table (13): Correlation between LVMI and clinical parameters.

Parameters	LVMI		Sig.
	r	P	
Age (years)	+ 0.636	<0.05	S
Height (cm)	+ 0.129	>0.05	NS
Weight (kg)	+ 0.252	<0.05	S
BSA	+ 0.219	<0.05	S
BMI	+ 0.263	<0.05	S

LVMI = Left ventricular mass index

BSA = Body surface area

BMI = Body mass index

S = Significant

NS = Non significant

Table (14): Correlation between LVMI and causal & ambulatory blood pressure readings.

Parameters	LVMI		Sig.
	r	P	
Mean causal BP readings:	+ 0.201	>0.05	NS
Mean ABPM readings:			
A- Day time:			
TAG (1)	+ 0.352	<0.05	S
TAG (2)	+ 0.537	<0.05	S
TAG (3)	+ 0.548	<0.05	S
B- Sleep period:	+ 0.569	<0.01	HS
C- Average 24-h BP:	+ 0.533	<0.05	S
D- 24-h BP variations	+ 0.290	<0.05	S

LVMI = Left ventricular mass index

TAG (1) = Time period starting from arising time → 10 AM

TAG (2) = Time period starting from 10 AM → 7 PM

TAG (3) = Time period starting from 7 PM → sleep time

ABPM = Ambulatory blood pressure monitoring

NS = Non significant

S = Significant

HS = Highly significant

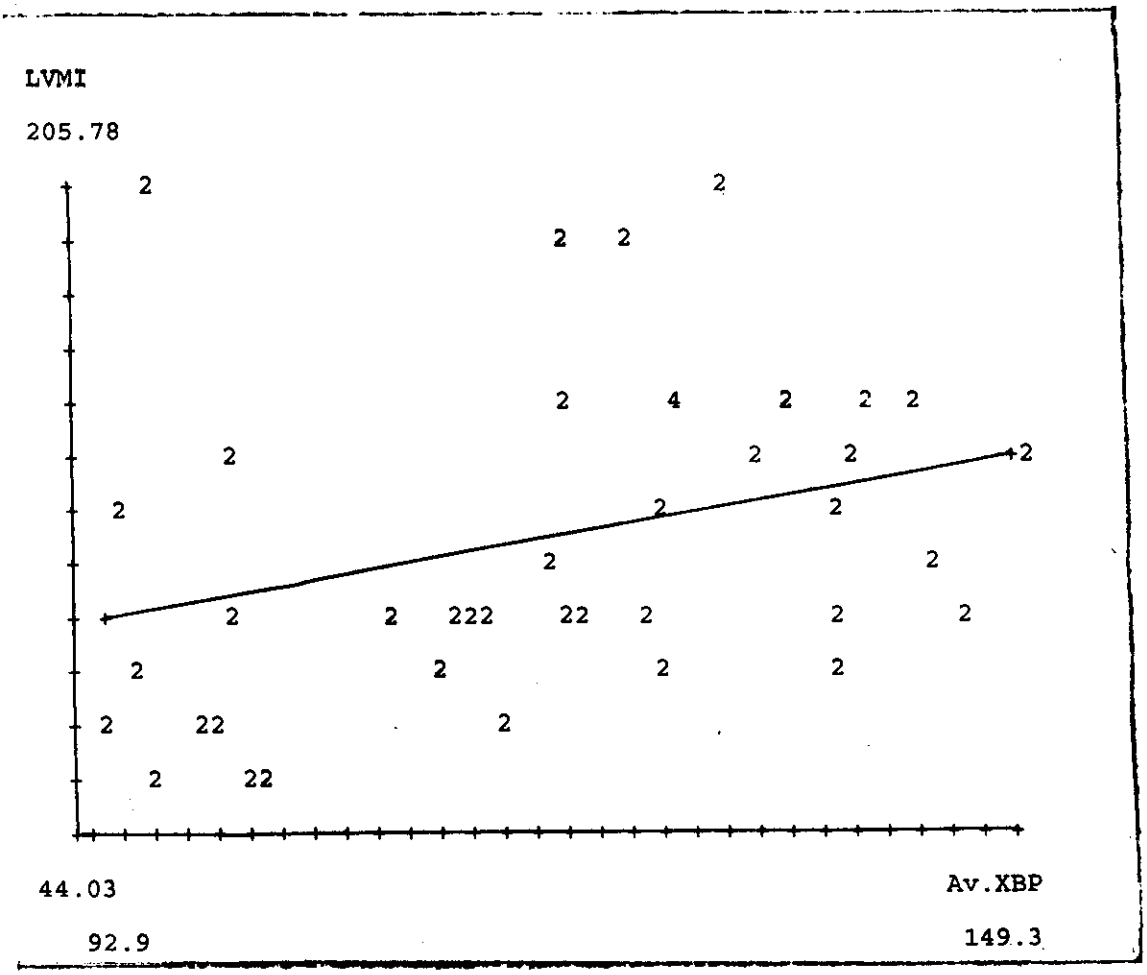


Fig. (10): Relationship between mean ambulatory blood pressure in (day time) and left ventricular mass index.

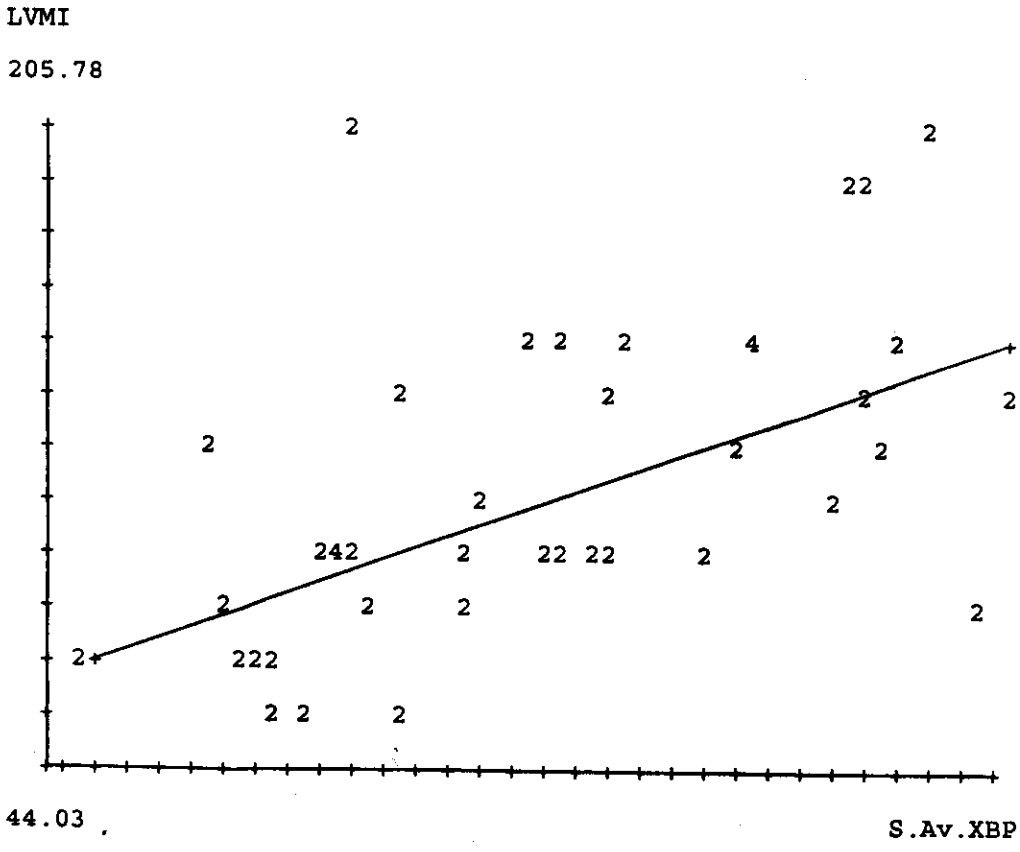


Fig. (11): Relationship between mean ambulatory blood pressure in (night time) and LVMI.

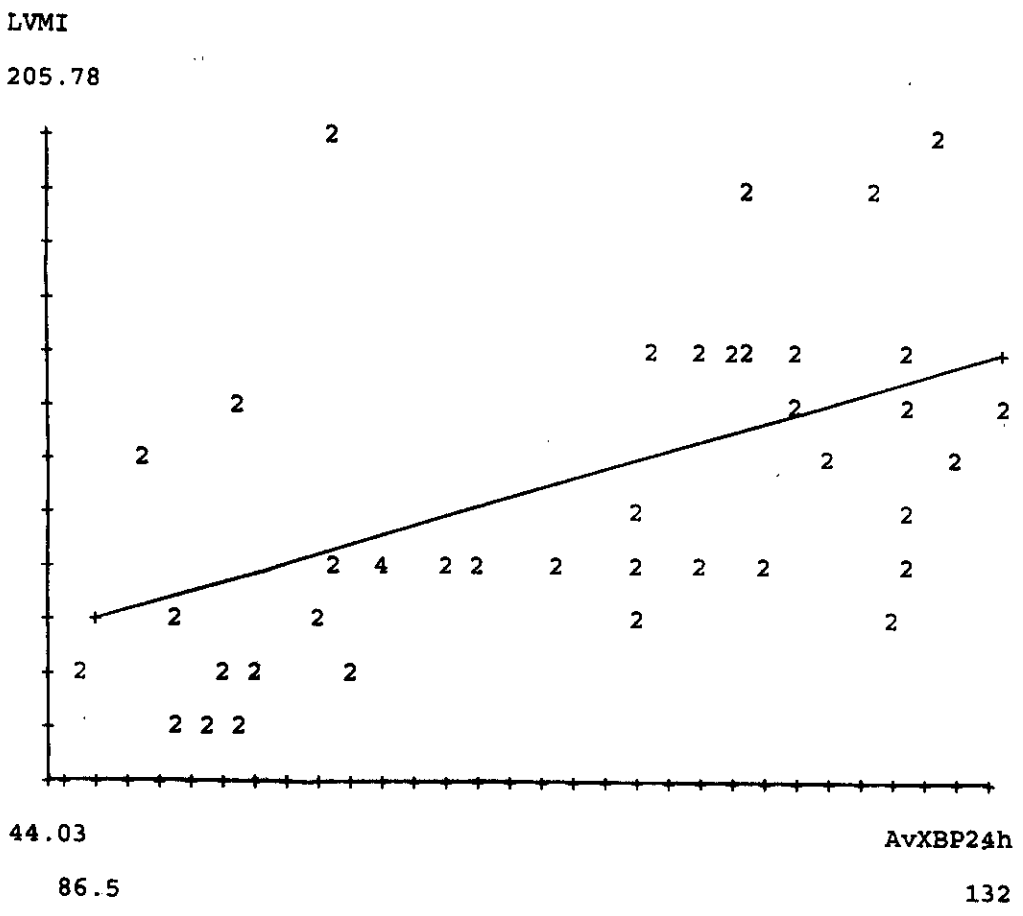
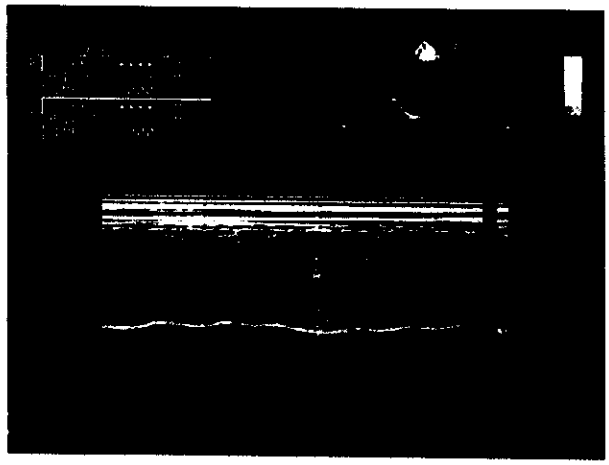


Fig. (12): Relationship between mean ambulatory blood pressure (throughout 24-h) and LVMI.



((patient No 13))

Figure (13): M-mode echocardiogram of the left ventricle at the chordal level showing concentric LVH.

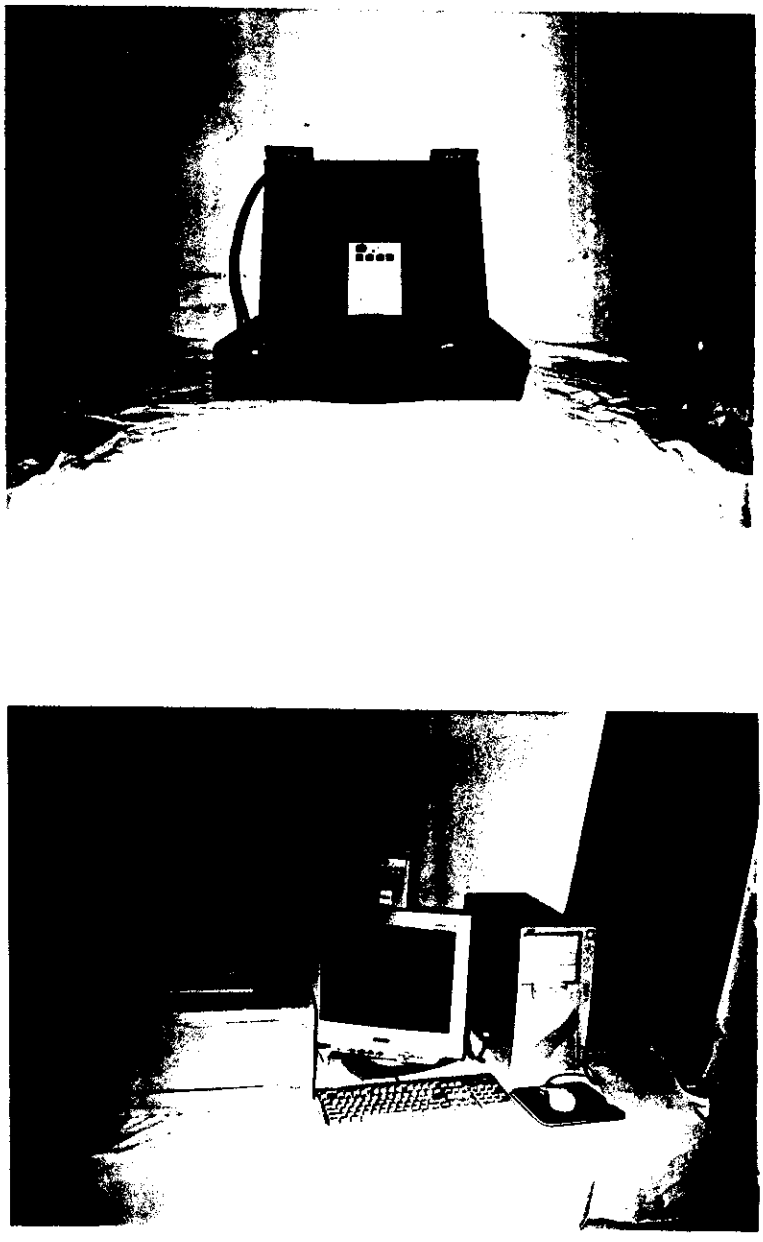


Fig. (14): Ambulatory blood pressure monitoring apparatus.

Patients No: 40 **Date: 29/10/98**

OXFORD AMBULATORY BLOOD PRESSURE REPORT RESULTS PRINTOUT			
Sample		Blood pressure	
No.	Time	Systolic/Diastolic mmHg	Mean mmHg
1	10.30	127/84	98
2	11.00	121/77	92
3	11.30	130/87	101
4	12.00	131/82	98
5	12.30	117/83	94
6	1.00	100/68	78
7	1.30	108/67	80
8	2.00	113/72	85
9	2.30	119/76	90
10	3.00	115/75	88
11	3.30	112/78	89
12	4.00	106/74	84
13	4.30	100/70	80
14	5.00	115/73	86
15	5.30	110/66	80
16	6.00	123/75	91
17	6.30	107/78	88
18	7.00	109/78	89
19	7.30	105/65	78
20	8.00	95/65	75
21	8.30	102/75	84
22	9.00	113/88	96
23	9.30	125/73	90
24	10.00	91/65	73
25	10.30	100/68	78
26	11.00	100/64	76
27	11.30	93/70	77
28	12.30	105/70	82
29	1.30	106/67	80
30	2.30	111/72	85
31	3.30	107/77	87
32	4.30	107/70	82
33	5.30	109/77	87
34	6.30	116/69	84
35	7.30	109/85	93
36	8.30	137/86	103
37	9.00	135/86	102
38	9.30	137/88	104

Fig. (15): Ambulatory blood pressure monitoring of normal subject.

Patients No: 21 **Date: 18/7/98**

OXFORD AMBULATORY BLOOD PRESSURE REPORT RESULTS PRINTOUT			
Sample		Blood pressure	
No.	Time	Systolic/Diastolic mmHg	Mean mmHg
1	10.00	170/108	129
2	10.30	169/107	128
3	11.00	165/104	124
4	11.30	171/108	129
5	12.00	163/105	124
6	12.30	166/100	122
7	1.00	159/103	122
8	1.30	172/113	132
9	2.00	165/109	128
10	2.30	167/107	127
11	3.00	169/108	128
12	3.30	159/106	124
13	4.00	167/110	129
14	4.30	170/107	128
15	5.00	173/114	134
16	5.30	170/105	127
17	6.00	168/108	128
18	6.30	170/103	125
19	7.00	171/109	130
20	7.30	173/108	130
21	8.00	168/107	127
22	8.30	169/106	127
23	9.00	171/112	132
24	9.30	163/100	121
25	10.00	166/103	124
26	10.30	177/113	134
27	11.00	168/97	121
28	12.00	153/96	115
29	1.00	149/90	110
30	2.00	146/89	108
31	3.00	139/92	108
32	4.00	148/89	109
33	5.00	150/94	113
34	6.00	153/96	115
35	7.00	160/95	117
36	8.00	166/105	125
37	8.30	170/109	129
38	9.00	173/108	130
39	9.30	174/106	129

Fig. (16): Ambulatory blood pressure monitoring of hypertensive dipper subject.

Patients No: 13 **Date: 28/6/98**

OXFORD AMBULATORY BLOOD PRESSURE REPORT RESULTS PRINTOUT			
Sample		Blood pressure	
No.	Time	Systolic/Diastolic mmHg	Mean mmHg
1	10.30	160/98	119
2	11.00	157/96	116
3	11.30	159/97	118
4	12.00	153/91	112
5	12.30	154/93	114
6	1.00	156/94	115
7	1.30	153/93	113
8	2.00	160/99	119
9	2.30	151/98	116
10	3.00	155/95	115
11	3.30	154/94	114
12	4.00	160/99	119
13	4.30	159/96	117
14	5.00	157/97	117
15	5.30	149/91	110
16	6.00	148/93	111
17	6.30	149/96	114
18	7.00	153/95	114
19	7.30	158/96	117
20	8.00	149/93	112
21	8.30	148/94	112
22	9.00	160/99	118
23	9.30	157/93	114
24	10.00	149/92	111
25	10.30	150/90	110
26	11.00	160/99	119
27	12.00	159/94	116
28	1.00	149/93	112
29	2.00	159/98	118
30	3.00	160/99	119
31	4.00	157/96	116
32	5.00	158/98	118
33	6.00	153/94	114
34	7.00	155/95	115
35	8.00	160/97	118
36	8.30	159/98	118
37	9.00	153/96	115
38	9.30	159/97	118
39	10.00	157/97	117

Fig. (17): Ambulatory blood pressure monitoring of hypertensive non-dipper subject.