RESULTS

(A) Clinical Results :

(1) Sex :

The obese children (25) included 19 males (**76%**) and 6 females (**24%**)

(2) Age :

The age of obese children ranged from 3 to 15 years .

(3) B.M.I :

In the obese children B.M.I ranged from 23.9 to 42.6

(4) Height :

In the obese children height ranged from 95 to 172.6 c.m

(5) Weight :

In the obese children weight ranged from 27 to 123 k.g

(6) Triceps skin fold :

In obese children triceps skin fold ranged from 16.8 to 36.1 c.m

(7) Subscapular skin fold :

In obese children subscapular skin fold ranged from 14.3 to 29.9 c.m

(8) Obesity index :

In obese children obesity index ranged from 1.44 to 3.07

(9) Blood pressure :

In obese children systolic blood pressure ranged from 90 to 120 and the diastolic ranged from 60 to 85 mmhg .

(B) Echocardiographic results :

1) Comparison between echocardiographic results of obese children and control group of the same age group .

**** First age group (3 - 6 years)**

In this age group the thickness of the LA, AO, RV, LVEDD, LVESD, LVPW (D) , LVS (D) , LVM are statistically significant higher in obose children in comparison to standard group of the same age but the thickness of PA is statistically significant lower in obese children in comparison with standard group of the same age , and the value of SV, EF are statistically significant less than normal in obese children in comparison with control group of the same age but change in FS is not significant .

(Table 3)

**** Second age group (7 - 9 years)**

In this age group the thickness of LA, AO, LVEDD, LVPW(D), RV, LVESD are statistically significant higher in obese children in comparison to control group of the same age and LVM statistically higher than control group but not significant and IVS(D) is not significantly changed . The value of SV, is statistically significant less than normal value of the same age group but the change in FS, EF not significant .

(Table 4)

**** Third age group (10 - 15 years)**

In this age group the thickness of the LA, AO, RV, LVPW (D) , IVS (D)LVM are statistically significant higher in obese children in comparison to control group of the same age but PA , LVEDD are statistically significant lower in obese children in comparison to control group of the same age. and the change in LVESD is not significant . The value of SV is statistically significant less than normal value in comparison with control group of the same age . But the change in FS and EF are not significant .

(Table 5)

2) Correlation between echocardiographic finding and clinical data in obese children .

I .Correlation between age of obese patient and echocardiographic finding

Correlation the age of obese patient with echocardiographic finding revealed stronge postive correlation with LVPW (S) and moderate postive correlation with LA, AO, PA, SV, FS, LVEDD, LVPW (D), IVS (D), IVS(S) , LVM and mild postive correlation with RV, EF . But no significant correlation with LVESD .

(Table 8)

II .Correlation between weight and echocardiographic finding in obese childern .

Correlation the weight of obese patient with echocardiographic finding revealed strong postive significant correlation with LA, LVPW (S) and moderate postive significant correlation with AO, RV, PA, SV, FS, LVPW (D) , IVS (S) , IVS (D) , LVM and mild postive significant correlation with EF , LVEDD .. But no significant correlation with LVESD .

(Table 9)

III .Correlation between echocardiographic finding and Height in obese childern

Correlation the hieght with echocardiographic finding revealed strong postive correlation with LVPW (S) and moderate postive correlation with LA, AO, PA , SV, EF, RV, LVPW (D) , IVS (S) , IVS (D) LVM and mild postive significant correlation with FS , LVEDD and no significant correlation with LVESD .

(Table 10)

IV.correlation between echocardiographic finding and B.M.I in obese childern .

Correlation the B.M.I with echocardiographic finding revealed mild postive correlation with LA , AO ,PA , SV , FS , LVESD , LVPW(S) , LVPW (D) , IVS (S) , IVS (D) LVM and not significant correlation with EF , LVEDD , RV .

(Table 11)

V.Correlation between echocardiographic finding and obesity index in obese childern .

Correlation the obesity index with echocardiographic finding reveaeld mild postive non significant correlation with LA , RV, FS , IVS (S) , IVS (D) , LVM but mild postive significant correlation with SV and not significant correlation with AO, PA, EF , LVEDD , LVESD, LVPW(S) , LVPW (D) .

(Table 12)

VI .Correlation between echocardiographic finding and triceps skin fold in obese childern .

Correlation the triceps skin fold with echocardiographic finding revealed moderate postive correlation with LA , AO , PA , SV , FS , LVPW (S) LVPW (D) , LVS (S) , IVS (D) and LVM and mild postive correlation with RV , EF , LVEDD , and not significant correlation with LVESD .

(Table 13)

VII .Correlation between echocardiographic finding and subscapular skin fold in obese childern .

Correlation the subscapular skin fold with echocardiographic finding revealed moderate postive correlation with LA , AO , SV , FS, LVPW (S) LVPW (D) , IVS (S) , IVS (D) , LVM and mild postive correlation with RV , PA , EF , LVEDDand not significant correlation with LVESD .

(Table 14)

VIII. Correlation between echocardiographic finding and systolic blood pressure in obese childern .

Correlation the systolic blood pressure with echocardiographic finding reveald strong postive correlation with LVPW (S) and moderate postive correlation with LA , AO , RV, PA , SV , FS , LVEDD , LVPW (D) , IVS (D) , IVS (S) , LVM and mild postive correlation with EF and not significant correlation with LVESD

(table 15)

IX. Correlation between echocardiographic finding and diastolic blood pressure in obese childern .

Correlation the diastolic blood pressure and echocardiographic finding reveald strong correlation with LVPW (S) and moderate postive correlation with LA , AO , PA , SV , LVEDD , LVPW (D), LVM . and mild postive correlation with RV, FS , EF , IVS (S) , LVS (D) and not significant with LVESD .

(table 16)

3)Comparison of clinical finding in obese childern in relation to sex

There are different between males and females in clinical data .

Weight , Age , Height , S.B.P and D.B.P are higher in males than females but B.M.I , O.I , triceps skin fold and subscapular skin fold are higher in females than males . (table 6)

4) Comparison of echocardiographic finding in obese patients in relation to sex .

There are different between males and females in echocardiographic data .

LA , AO , RV , PA , SV , LVEDD , LVESD , LVPW(S) , LVDW(D) , IVS(S) , IVS(D) and LVM are higher in males than females but EF and FS are higher in females than males . (table 7)

TABLE (1)

Clinical data in different age groups

Groups / Clin.Data	3-6 years Mean+SD	7-9 years Mean+SD	10-15years Mean+SD	F	P
Weight	35.1±7.96	44.4±8.65	74 ±8.65	16.324	≤ 0.0001
Height	110.6±10.13	127.16±7.83	147.67±13.11	27.063	≤ 0.0001
B.M.I	28.9±3.94	27.54±4.54	33.62±5.26	3.894	< 0.05
O.I	2.066±0.449	1.898±0.446	2.101±0.585	0.275	> 0.05
Tr.skin.fold	20.9±3.33	23.2 ±3.89	31.26±3.78	21.465	< 0.0001
Sub.skin.fold	17.64±3.67	19.74±4.23	26.49±3.41	15.574	< 0.0001
S.B.P	95.6±3.91	106.0±4.18	113.64±5.95	32.576	< 0.0001
D.B.P	64.78±2.59	70.0±0.0	74.09±4.91	16.040	< 0.0001

TABLE (2)

echocardiographic findings in different age groups

Group / Echo Data	3-6 years	7-9 years	10-15 years	F	P
	Mean ± SD	Mean ± SD	Mean ± SD		
LA	21.6 ± 2.11	2 5 .4 ± 1.93	29.06 ± 7.27	6.14	< 0.01
AO	18.78 ± 2.00	21.34 ± 1.33	24.24 ± 3.75	11.288	< 0.001
RV	17.17 ± 2.95	18.42 ± 3.08	22.16 ± 6.55	2.722	> 0.05
PA	15.82 ± 2.09	16.76 ± 2.08	18.48 ± 4.01	1.864	> 0.05
SV	38.06 ± 10.65	47.42 ± 23.32	60.38 ± 19.76	3.64	< 0.05
FS	29.67 ± 6.00	34.6 ± 8.08	39.36 ± 4.95	6.495	< 0.01
EF	61.89 ± 6.97	67.4 ± 8.76	70.45 ± 7.69	3.122	< 0.05
LVEDD	39.16 ± 3.29	39.12 ± 6.79	44.22 ± 6.71	1.558	> 0.05
LVESD	27.39 ± 2.64	25.54 ± 4.35	27.45 ± 5.44	0.521	> 0.05
LVPW(S)	7.21 ± 0.96	9.54 ± 1.26	11.02 ± 1.96	15.172	< 0.0001
LVPW(D)	6.26 ± 1.12	7.5 ± 1.27	8.83 ± 1.23	11.409	< 0.001
IVS(S)	7.44 ± 1.24	8.98 ± 1.13	10.0 ± 2.34	5.311	< 0.01
IVS(D)	6.11 ± 1.42	6.98 ± 1.29	8.75 ± 1.83	7.028	< 0.01
LVM	85.62 ± 34.16	94.86 ± 15.19	155.17 ± 57.49	6.935	< 0.01

TABLE (3)

Comprison of echocardiographic findings in obese children age 3-6 years compared to standard range of this age

Echo data	Standard range	Obese childern age 3-6 years					X^2	P
		Range	Mean+SD	Below Stan-dard	As stan-dard	Abovc stan-dard		
LA	18-21	18.1-24.0	21.6±2.11	-	4	5	6.923	< 0.01
AO	16-21	16-22	18.78±2.0	-	4	5	69.23	< 0.01
RV	12-15	12.3-22	17.17±2.92	-	2	7	11.455	< 0.001
PA	17-19	13-19	15.82±2.09	6	3	-	9.00	< 0.01
SV	60-80	27-57	38.66±10.65	9	-	-	18.00	< 0.001
FS	25-45	21-37	29.67±6.0	2	7	-	2.25	> 0.05
EF	65-85	51-74	61.89±6.9	6	3	-	9.00	< 0.01
LVEDD	32-35	34-46	39.16±3.29	-	1	8	14.4	< 0.001
LVESD	9-14	22-30	27.39±2.64	-	-	9	18.00	< 0.0001
LVDW(S)	-	6 - 8	7.21±0.96	-	-	-	-	-
LVPW(D)	4-5	5-8	6.76±1.12	-	3	6	9.00	< 0.01
IVS(S)	-	6-10	7.44±1.24	-	-	-	-	-
IVS(D)	4-6	5-9	6.11±1.42	-	5	4	5.143	< 0.05
LVM	30-35	47.7-158.8	85.62±34.16	-	1	8	14.4	< 0.001

TABLE(5)

Comparison of echocardiographic findings in obese children aged 10-15 years compared to standared range of that age

Echo data	Standard Range	Obese childern aged 10-15 years					X^2	P
		Range	Mean±SD	Below stan-dard	AS stan-dard	Above stan-dard		
LA	23-27	19-41.5	29.66±7..27	3	1	7	18.333	≤ 0.001
AO	21-25	20-32	24.84±3.75	2	3	6	12.571	≤ 0.01
RV	17-20	13-31.7	22.16±6.55	3	2	6	15.231	≤ 0.001
PA	21-23	14-24.5	18.48±4.01	8	1	2	18.33	≤ 0.001
SV	60-80	31.3-91.9	60.38±19.76	5	5	1	8,25	< 0.05
FS	25-45	32-49	39.36±4.95	-	9	2	2.2	> 0.05
EF	65-85	54-80	70.45±7.69	2	9	-	2.2	> 0.05
LVEDD	42-49	32.7-51.9	43.22±6.71	5	4	2	10.267	≤ 0.01
LVESD	20-38	19.5-37	27.95±5.49	1	10	-	1.048	> 0.05
LVWP(S)	-	8-13.3	11.02±1.96	-	-	-	-	-
LVWP(D)	7-8	7-11.0	8.85±1.22	-	3	8	12.571	≤ 0.001
IVS(S)	-	7.6-14	10.0±2.34	-	-	-	-	-
IVS(D)	7-8	6.9-13.0	8.75±1.83	1	5	5	8.25	≤ 0.05
LVM	100-170	77.2-283.2	155.17±57.49	2	6	3	6.471	≤ 0.05

TABLE(6)

Comparison of clinical findings in obese children in relation to sex

	Female Mean ±SD	Male Mean±SD	T	P
Age (years)	7.67 ± 3.33	8.52 ± 3.45	0.947	> 0.05
weight (kg)	49.22 ± 17.96	55.99 ± 26.0	0.591	> 0.05
Height (cm)	122.63 ± 17.32	132.6 ± 20.65	1.069	> 0.05
BMI	31.17 ± 6.11	30.58 ± 5.09	0.235	> 0.05
O.I	2.10 ± 0.56	2.03 ± 0.49	0.308	> 0.05
Tri. skin fold (cm)	26.65 ± 6.24	25.77 ± 6.07	0.308	> 0.05
Sub.skin fold (cm)	23.2 ± 5.63	21.56 ± 5.49	0.633	> 0.05
S.B.P (mmhg)	103.33 ± 9.83	106.3 ± 9.55	0.663	> 0.05
D.B.P (mmhg)	67.17 ± 3.19	70.8 ± 5.83	1.439	> 0.05

TABLE (7)

Echocardiographic findings in obese patients in relation to sex

	Female Mean±SD	Male Mean±SD	T	P
LA	21.8 ± 2.92	27.18 ± 6.38	1.958	≤ 0.05
AO	20.75 ± 4.19	22.34 ± 3.84	0.867	> 0.05
RV	15.62 ± 2.99	20.88 ± 5.26	2.315	< 0.05
PA	16.73 ± 2.26	17.32 ± 3.51	0.383	> 0.05
SV	44.12 ± 11.64	51.82 ± 21.63	0.827	> 0.05
F.S	37.0 ± 5.22	34.26 ± 7.78	0.801	> 0.05
EF	70.17 ± 6.92	65.68 ± 857	1.161	> 0.05
LVEDD	37.83 ± 6.91	41.92 ± 6.09	1.528	> 0.05
LVESD	26.13 ± 3.81	27.63 ± 4.50	0.731	> 0.05
LVPW(S)	8.58 ± 2.19	9.59 ± 2.30	0.948	> 0.05
LVPW(D)	7.2 ± 1.34	7.77 ± 1.73	0.74	> 0.05
IVS(S)	7.47 ± 0.79	9.38 ± 2.2	2.06	< 0.05
IVS(D)	6.93 ± 1.13	7.61 ± 2.16	O.73	> 0.05
L.V.M	98.17 ± 32.46	124.4 ± 58.8	1.032	> 0.05

TABLE (8)

Correlation between age of obese patients and echocardiographic findings

Age / Echo	r	P
LA	0.653	< 0.001
AO	0.678	< 0.001
RV	0.472	< 0.01
PA	0.546	< 0.01
SV	0.629	< 0.001
FS	0.542	< 0.001
EF	0.422	< 0.05
LVEDD	0.524	< 0.01
LVESD	0.147	> 0.05
LVPW(S)	0.798	< 0.001
LVPW(D)	0.698	< 0.001
IVS(S)	0.515	< 0.01
IVS(D)	0561	< 0.001
L.V.M	0.664	< 0.001

TABLE (9)

Correlation between echocardiographic findings and weight in obese children

weigh / Echo	r	P
LA	0.757	< 0.001
AO	0.533	< 0.01
RV	O.613	< 0.001
PA	0.596	< 0.001
SV	0.745	< 0.001
FS	0.584	< 0.001
EF	0.398	< 0.05
LVEDD	0.497	< 0.01
LVESD	0.199	> 0.05
LVPW(S)	0.765	< 0.001
LVPW(D)	0.667	< 0.001
IVS(S)	0.583	< 0.001
IVS(D)	0.598	< 0.001
LVM	0.709	< 0.001

TABLE(10)

Correlation between echocardiographic findings and Height in obese children

Height / Echo	r	P
LA	0.734	< 0.001
AO	0.599	< 0.001
RV	0.672	< 0.001
PA	0.611	< 0.001
SV	0.729	< 0.001
FS	0.672	< 0.001
EF	0.489	< 0.01
LVEDD	0.497	< 0.01
LVESD	0.111	> 0.05
LVPW(S)	0.831	< 0.001
LVPW(D)	0.713	< 0.001
IVS(S)	0.643	< 0.001
IVS(D)	0.612	< 0.001
LVM	0.699	< 0.001

TABLE(11)

Correlation between B.M.I and echocardiographic findings

BMI / Echo	r	P
LA	0.433	< 0.05
AO	0.442	< 0.05
RV	0.243	> 0.05
PA	0.336	< 0.05
SV	0.457	< 0.05
FS	0.334	> 0.05
EF	0.155	> 0.05
LVEDD	0.227	> 0.05
LVESD	O.290	> 0.05
LVPW(S)	0.363	< 0.05
LVPW(D)	0.359	< 0.05
IVS(S)	0.305	> 0.05
IVS(D)	0.363	< 0.05
LVM	0.418	< 0.05

TABLE(12)

Correlation between obesity index and echocardiographic findings

O.I / Echo	r	P
LA	0.283	> 0.05
AO	0.064	> 0.05
RV	0.346	> 0.05
PA	0.228	> 0.05
SV	0.371	< 0.05
FS	0.310	> 0.05
EF	0.227	> 0.05
LVEDD	0.009	> 0.05
LVESD	0.048	> 0.05
LVPW(S)	0.217	> 0.05
LVPW(D)	0.234	> 0.05
IVS(S)	0.288	> 0.05
IVS(D)	0.290	> 0.05
LVM	0.278	> 0.05

TABLE (13)

Correlation between tricep skin fold and echocardiographic findings

Tri. skin fold / Echo	r	P
LA	0.569	< 0.001
AO	0.534	< 0.01
RV	0.445	< 0.05
PA	0.508	< 0.01
SV	0.605	< 0.001
FS	0.593	< 0.001
EF	0.399	< 0.05
LVEDD	0.374	> 0.05
LVESD	0.203	< 0.05
LVPW(S)	0.717	< 0.001
LVPW(D)	0.719	< 0.001
IVS(S)	0.541	< 0.01
IVS(D)	0.607	< 0.001
LVM	0.656	< 0.001

TABLE (14)

Correlation between subscapular skin fold and echocardiographic findings

Sub. skin fold / Echo	r	P
LA	0.512	< 0.01
AO	0.506	< 0.01
RV	0.397	< 0.05
PA	0.417	< 0.05
SV	0.572	< 0.001
FS	0.583	< 0.001
EF	0.402	< 0.05
LVEDD	0.300	< 0.05
LVESD	0.142	< 0.05
LVPW(S)	0.685	< 0.001
LVPW(D)	0.727	< 0.001
LVS(S)	0.524	< 0.01
LVS(D)	0.619	< 0.001
LVM	0.636	< 0.001

TABLE (15)

Correlation between S. B. P. and echocardiographic findings

S.B.P / Echo	r	P
LA	0.686	≤ 0.001
RO	0.645	≤ 0.001
RV	0.511	≤ 0.01
PA	0.552	≤ 0.01
SV	0.703	< 0.001
FS	0.60	< 0.001
EF	0.427	< 0.05
LVEDD	0.520	< 0.01
LVEDD	0.193	> 0.05
LVPW(S)	0.766	< 0.001
LVPW(D)	0.636	< 0.001
LVS(S)	0.536	< 0.01
LVS(D)	0.558	< 0.001
LVM	0.648	< 0.001

TABLE(16)

Correlation between D. B.P.and echocardiographic findings

D.B.P. / Echo	r	P
LA	0.733	< 0.001
AO	0.512	< 0.01
RV	0.455	< 0.01
PA	0.582	< 0.01
SV	0.730	< 0.001
FS	0.498	< 0.01
EF	0.259	> 0.05
LVEDD	0.579	< 0.01
LVESD	0.241	> 0.05
LVPW(S)	0.797	< 0.001
LVPW(D)	0.608	< 0.001
LVS(S)	0.491	< 0.01
LVS(D)	0.423	<0.01
LVM	0.633	<0.001

FIGURE (1) DIFFERENCES BETWEEN OBESE AND NON-OBESE CHILDREN IN LEFT VENTRICULAR MASS .

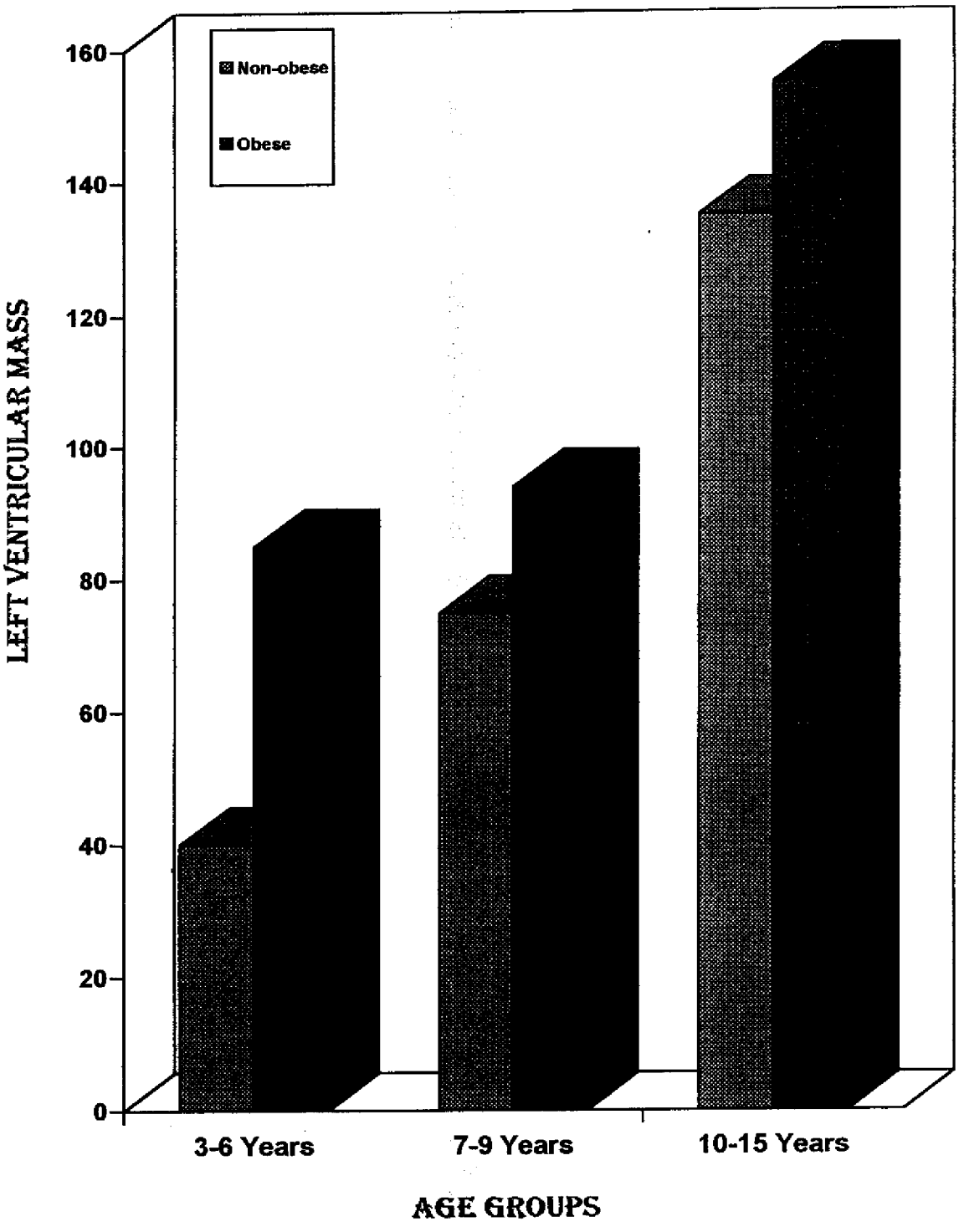


FIGURE 2 CORRELATION BETWEEN BMI AND LEFT VENTRICULAR MASS

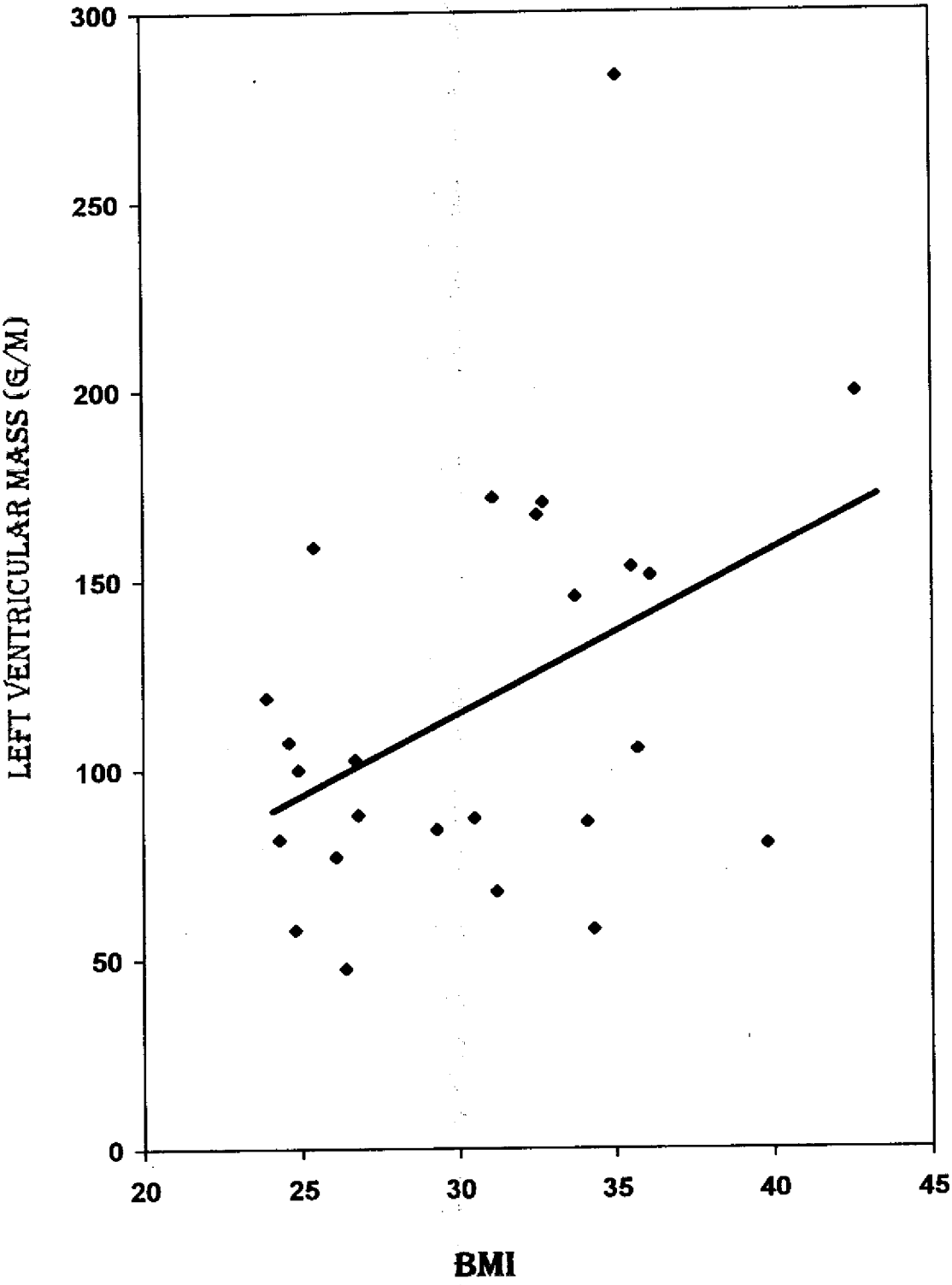
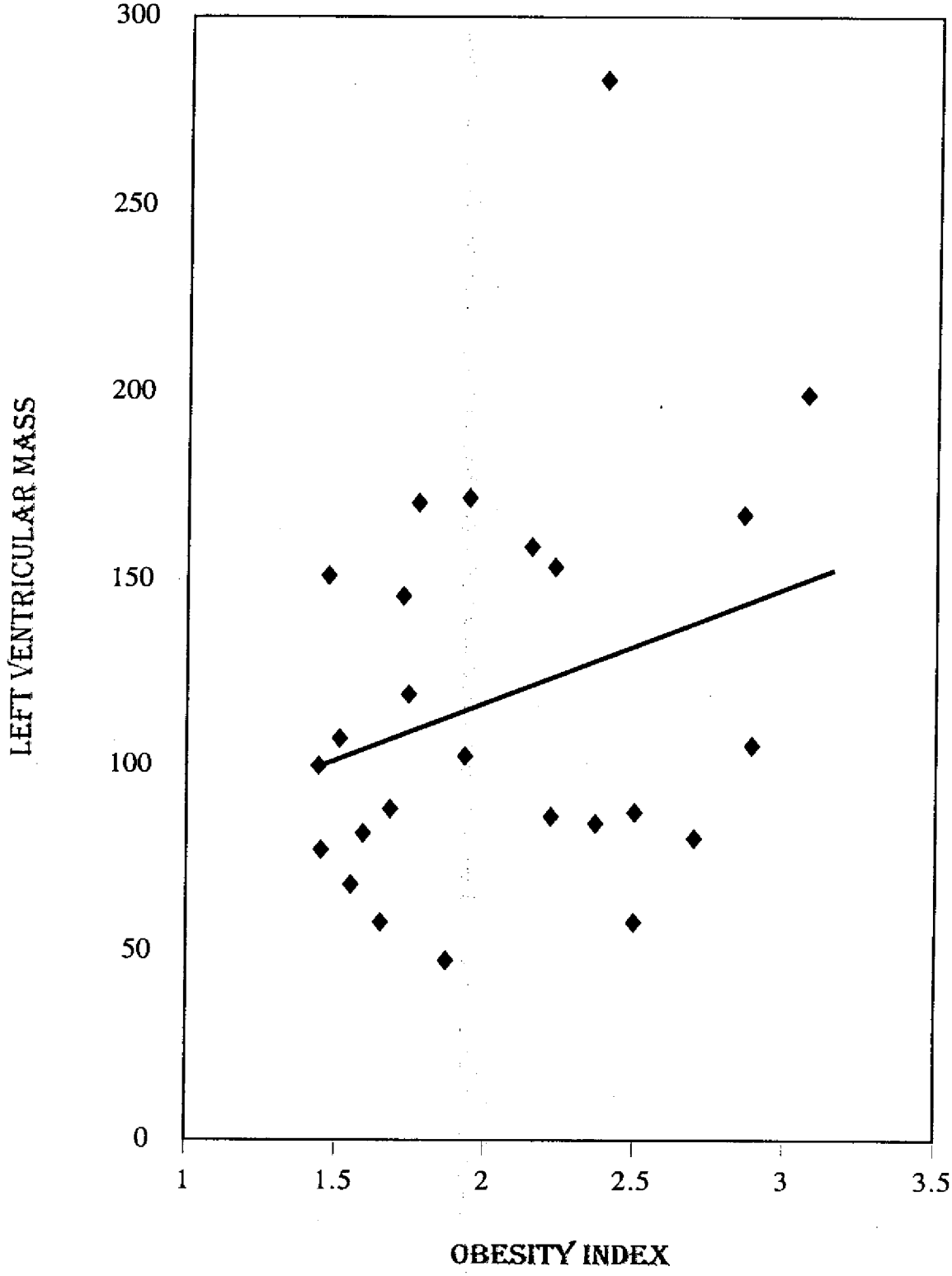


FIGURE (3) CORRELATION BETWEEN THE OBESITY INDEX AND LEFT VENTRICULAR MASS



DISCUSSION

Obesity has important health and social implications . Although many of the serious medical problems are deferred to adult life , an important proportion of adult obesity has its origins in childhood . Several studies have indicated that the degree of adiposity in infant is predictive of fatness in childhood and childhood adiposity , in run , is correlated with adult obesity .

(Charney , et al 1976) .

Obesity in adults is associated with cardio-vascular diseases (Hubert et al . 1983) . Many studies have linked obesity in adult with echocardiographic finding of increased left ventricular chamber size (Lauer et al 1991) A relativly few reports concerning the effect of obesity on the cardiovascular system were done in children ,(De Simone , et al 1992) .

Obesity has also been found to be associated with increased left ventricular wall thickness and left ventricular mass in both hypertensive and normotensive subjects (Johnson et al 1983) . Messerli et al 1983 suggest that obesity produces myocardial hypertrophy with parallel increase in left ventricular wall thickness and cavity dimensions . Obesity is a major risk factor for hypertension , diabetes , respiratory disease and psychologic problems (Dietz 1983) .

Our study included 25 normotensive child with simple obesity with age ranging from 3 to 15 years and a control group fixed figures .The studied cases were subjected to a thorough history taking and clinical examination and anthropometric assessment that included weight measurement using Halton balance and Height estimation using Haltonstadiometer . Subscapular and triceps skin fold thickness were measured by Halton skin caliper .

B.M.I was estimated as following

$$B.M.I = \frac{\text{weight}}{(\text{Height})^2}$$ (Kono et al 1994)

Obesity index was estimated as following

$$O.I = \frac{\text{Measured body weight}}{\text{Standard body weight}}$$ (Kono et al 1994)

Echocardiographic examination was performed to each subject in the Cardiology Clinic Cairo University Pediatric Hospital by using A TOSHIBA sonolayer - SSH - 65 A ultrasound system using a 2.5 , 3.5 MHZ transducer .

The laborabtory investigations included serum level of cortison 8H A.M and 8H P.M and serum level cortisol after suppression and serum level of cholesterol , triglyceride , high density lipoprotoin , low density lipoportein . The purpose of this study was to evaluate the effect of obesity on the function and structural parameters of the heart in normotensive simple obese children attending the Diabetic Endocrine Metabolic Pediatric Unit of Cairo University Children Hospital .

In our study we found that L.V.M , L.A , AO , RV , LVEDD , LVESD , IVS (D) , LVPW (D) were significantly higher in obese group in comparison with control group . But PA, SV, FS , EF were significantly lower in obese group in comparison to control group . The present study showed significant correlation between obesity and left ventricular mass in childern aged 3 to 15 years ($P < 0.001$) (Table 9) . There was a significant difference between males and females in the effect of obesity on the left ventricular mass .

Also there was an increase in the left ventricular mass with advancement of age . In our study we found that obesity affect the left ventricular mass and geometry of Egyption children . This is in agreement with (Yukiharu kono et al 1994) who studied the effect of obesity on echocardiographic parameters in Japanese\children . They studied 341 childern 106 first graders (age 6 years) , 166 seventh graders (age 12 years) and 69 tenth graders (age 15 years) . They were assigned to six groups according to school grade-sex .Obesity index as well as body mass index were used to estimate obesity .They found a significant correlation between obesity and left ventricular mass in Japanese children .

Lauer et al 1992 , studied the effect of obesity on left ventricular mass and geometry in adult subjects in the Framingham Heart study . Their subjects were free of cardiopulmonary disease and were not taking cardiovascular medications .M-mode studies that were adequate for estimating left ventricular mass were available in 624 men and 1,209 women . Height and weight measured at the time of echocardiography were used to calculate body mass index as a measure of obesity . They found that there was a significant correlation between obesity and left ventricular mass .

Our results were in agreement with (De Simone et al 1992) who studied left ventricular mass and body size in normotensive children and adults. Three normotensive population samples in New York city (127 adult) , Napples , Italy (114 adults) and Cincinnati , Ohio (444 infants to young adults) were studied by echocardiography . They suggested that the physiological explanation for association of obesity with left ventricular mass may relate to volume demand of adipose tissue and pressure loading condition observed in obesity .

In our study we found significant correlation between B.M.I and L.V.M ($P < 0.05$) (Table 11) and no significant correlation between O.I and L.V.M ($P > 0.05$) (Table 12) , in contrast with the observation of (Kono et al 1994) who found that obesity index was more strongly correlated with measurement of the left ventricular mass than body mass index this may be due to changes in habitual diet .

In our study there is moderate correlation between left ventricular mass and height . This is in agreement with (Lauer et al 1992) who chose to use height correlation because body surface area correlation may fail to identify obese subjects with left ventricular hypertrophy . Previous work at Framingham has demonstrated that the use of body surface area corrections attenuate but does not eliminate the observed relation between obesity and echocardiographic left ventricular variables (Levy et al 1988) .

In our study there is different in left ventricular mass between males and females this result goes with those of Gardin , et al (1987) who studied effect of age , sex and body surface area on left ventricular mass .They found that different in L.V.M between male and female . For estimated L.V.M , female have L.V.M smaller than that in male . An increase in the left ventricular mass with the advancement of age was observed in our patient, the same observation reported by Gardin et al (1987) .

Lauer et al (1992) reported that obesity and hypertension each has distinct association with left ventricular mass and geomtery and that the strengths of the association are additive , but not synergistic . They studied children age 8 - 10 years and concluded that the increase in blood pressure tend to promote concentric left ventricular hypertrophy while obesity result in

left ventricular dilation and concentric form of hypertroply . Our subjects were normotensive simple obese childern so as to exclude any effect of the increased blood pressure on echocardiographic findings .

In our study there is moderate correlation between subscapular skin fold thickness and left ventricular mass this result agrees with those of (Lauer et al 1991) who found that an increase in subscapular skin fold thickness was associated with an increase in left ventricular mass but the strength of association between subscapular skin fold thickness and echocardiographic parameters were less marked than those of body mass index . This may be due to the inherent inaccuracies in the measurement of subscapular skinfold thickness .

Hypertensive subjects were excluded from this study , so the result may not reflect the effect of obesity in hypertensive population . Subject with congestive heart failure , valvular disease and coronary heart disease were also excluded as these condition present the greatest difficulties in the validity of M-mode measurments . (Borow 1989)

Variations in left ventricular mass may be in part explained by factors not addressed in this study such as genetic , neurohumoral and endocrine factors (Coreal et al 1983) blood viscosity (Deverx & Reichek 1977) .The use of M- mode echocardiography which inherently lacks the planer and three -dimentional information afforded by analysis of two dimentional orthogonal images may be another limitation .

However > 90% of the M- mode images analyzed were obtained with the aid of two - dimentional imaging procedure that improves the quantitative reliability of M- mode echocardiographiy (Vander Bossche et al 1984)

From this study, it is concluded that the obesity is significantly correlated with an increase in the left ventricular mass even after controlling for age and blood pressure . The increase in left ventricular mass associated with increasing adiposity reflects increase in both left ventricular wall thickness and left ventricular internal dimension . So pediatricians should recognize that obesity affects the left ventricular mass and goemetry in children as young as 6 years of age and should make parents aware of this finding and other potantial implications to persuade them to seek treatment for obesity for their obese children .

Futher studies should be performed to detect the effect of weight reduction in obese children on L.V.M and prospective study should be done to observe whether these echocardiographic changes will persist into adult life and to study the relation of these changes with the development of cardiac complications (e.g myocardial infarction or coronary heart disease) .