RESULTS

Results of the present study are shown in the following figures and tables:

Table-1 Comparison between cases and controls as regards age and sex

		Patients (n=25)	**Controls (n=20)**	**Student t test**	
				t	p
Age (years)		5.2 ± 3.54	4.2 ± 2.97	1.3	0.12
				Chi-square test	
				X^2	p
Sex	**Male**	15 (60.0 %)	12 (60.0 %)	0.0	1.0
	Female	10 (40.0 %)	8 (40.0 %)		

This table shows that both groups (the diseased one and the control) are statistically matched regarding age and sex.

Table-2 Glycogen storage types in the studied cases (n=25)

	No	**%**
Type I	2	8.0
Type III	10	40.0
Type IV	2	8.0
Not tested	11	44.0

This table(2) and figure (1) show that 2 patients (8.0 %) were GSD I, while 10 patients (40.0 %) were GSD type III and 2 patients were GSD type III (8.0 %). The remaining 11 patients (44.0 %) were not tested.the patients were diagnosed by enzymatic assey and liver biopsy

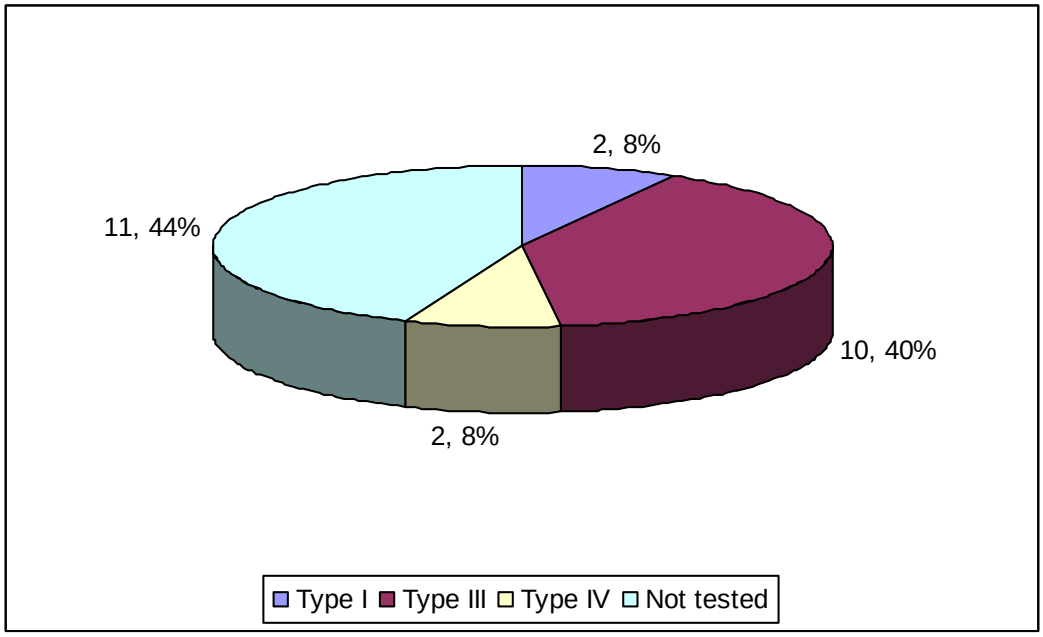

Fig. (1) GSD types in the studied cases

Table-3 Anthropometric measurements of the studied patients (n=25)

Weight (kg)	Range	7.5 - 40.0
	Mean ± SD	18.58 ± 8.31
Weight Z score	Range	-9.14 - 2.89
	Mean ± SD	-0.71 ± 2.33
Weight Z score < -2.0	N	4
	%	16.0
Height (cm)	Range	68.0 - 125.0
	Mean ± SD	94.44 ± 15.21
Height Z score	Range	-7.26 - 0.96
	Mean ± SD	-2.71 ± 1.82
Height Z score < -2.0	N	19
	%	76.0
BMI (kg/m2)	Range	10.38 – 34.29
	Mean ± SD	19.93 ± 3.93
BMI Z score	Range	-9.36 – 3.25
	Mean ± SD	1.11 ± 2.48
BMI Z score < -2.0	N	2
	%	8.0

This table shows that the weight of patients ranges from 7.5 - 40.0 kg with a mean of 18.58 ± 8.31 kg. They have a mean weight z score of -0.71 ± 2.33 with 4 patients (16.0 %) below -2.0 *(markedly underweight).* The height of patients ranges from 68.0 - 125.0 cm with a mean of 94.44 ± 15.21 cm. The mean height z score is -2.71 ± 1.82 cm with 19 patients (76.0 %) below -2.0 *(marked short stature).* The patients' BMI ranges from 10.38 – 34.29 kg/m2 with a mean of 19.93

± 3.93 kg/m2. They have a mean BMI z score of 1.11 ± 2.48 with 2 patients (8.0 %) below -2.0 *(markedly underweight).*

Table-4 Associated clinical findings in the studied patients (n=25)

		Range	**Mean ± SD**
Liver span		10.0 – 18.0	13.76 ± 2.35
		No	**%**
Splenomegaly	+	**12**	**48.0**
	-	13	52.0
Muscular involvement	+	**7**	**28.0**
	-	18	72.0
Cardiac involvement	+	**3**	**12.0**
	-	22	88.0
Renal involvement	+	**3**	**12.0**
	-	22	88.0

This table shows that hepatomegally is commonest clinical finding (100.0 %) with a mean liver span of 13.76 ± 2.35 followed by splenomegally (48.4 %), muscular involvement (28.0 %), cardiac involvement and renal involvement (12.0 %).

Table-5 Comparison of studied laboratory findings between patients and controls groups.

		Patients	Controls	Fisher's Exact test	
				X2	P
Liver enzymes	Normal	7 (28.0 %)	20(100.0 %)	24.0	0.0001
	Elevated	18 (72.0 %)	-		
Lipid profile	Normal	18 (72.0 %)	-	6.6	0.01
	Abnormal	7 (28.0 %)	20(100.0 %)		
Anemia	Present	17 (68.0 %)	8 (40.0 %)	3.53	0.06
	Absent	8 (32.0 %)	12 (60.0 %)		

This table shows that patients had significantly higher frequencies of cases with elevated liver enzymes and hyperlipidemia when compared with controls.

Table-6 Comparison of mean serum T3, T4, TSH and insulin levels among the studied groups

	Patients	**Controls**	**Student t test**	
			t	**P**
T3 (ng/dl)	85.5 ± 34.9	112.3 ± 27.7	2.41	0.07
T4 (µg/dl)	7.2 ± 3.8	10.2 ± 1.9	2.72	0.029*
TSH (µIU/mL)	3.6 ± 1.9	1.6 ± 0.8	2.97	0.047*
Insulin (µIU/mL**)**	3.8 ± 1.7	5.5 ± 1.3	1.56	0.11

This table(6) and figures (2,3,4,5) show that patients had significantly decreased in T4 serum levels compared to controls. In addition, Patients had significantly increased TSH serum levels compared to controls. In spite that patients had decreased both serum levels of T3 and insulin compared to controls but this difference did not reached to statistically significance values.

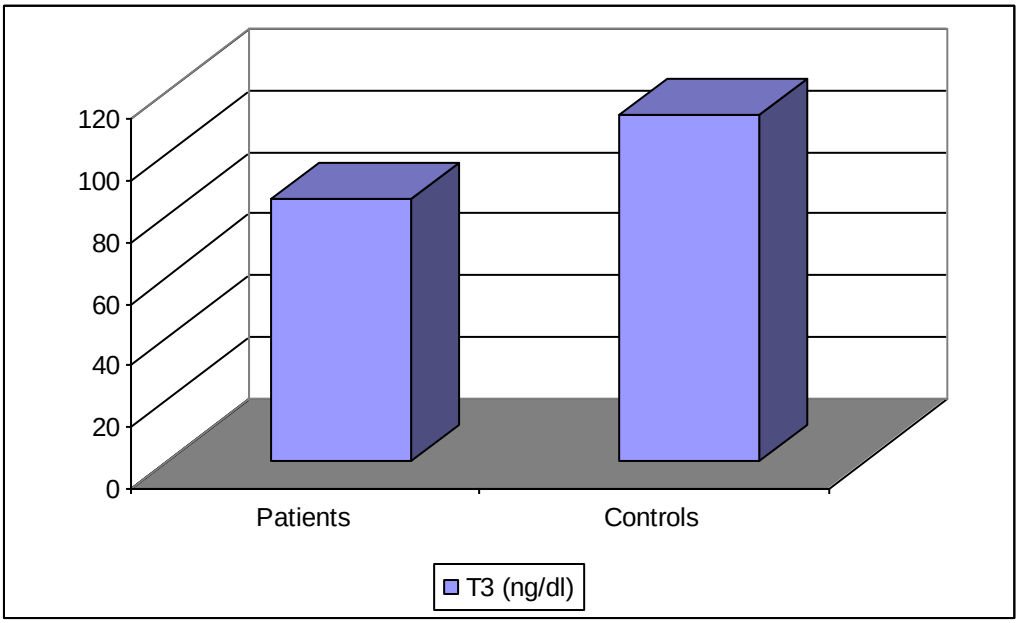

Fig. (2) Comparison of mean serum T3 among the studied groups

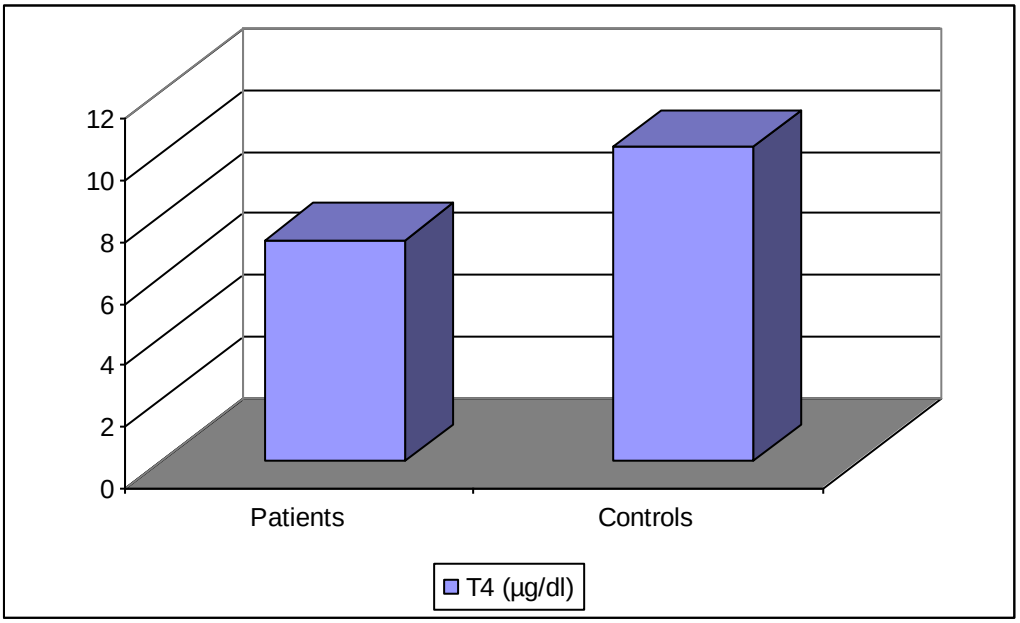

Fig. (3) Comparison of mean serum T4 among the studied groups

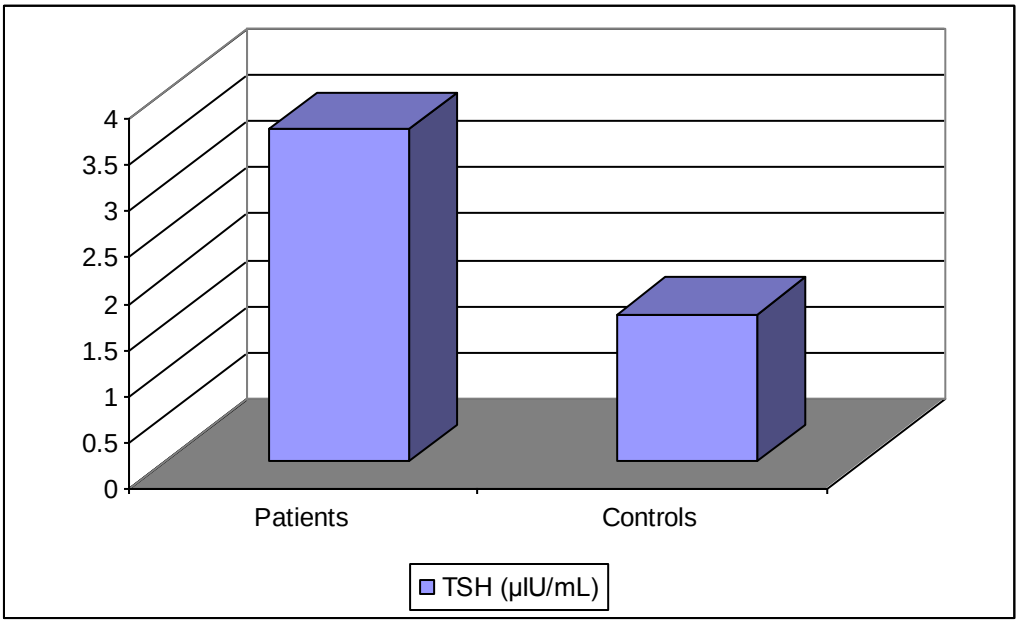

Fig. (4) Comparison of mean serum TSH among the studied groups

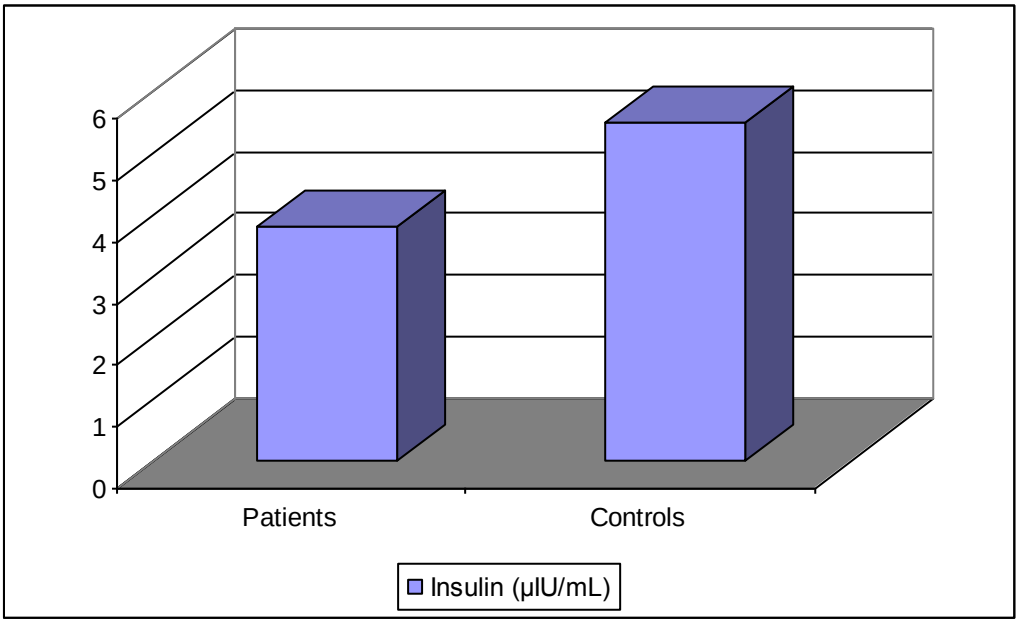

Fig. (5) Comparison of mean serum insulin among the studied groups

Table-7 frequency of hormonal disturbances among the studied groups

		Patients		Controls		Chi-square test	
		No	**%**	**No**	**%**	**X2**	**P**
T3	Normal	18	72.0 %	20	100.0	6.63	0.01*
	Decreased	7	28.0 %	-	-		
T4	Normal	16	64.0	20	100.0	9.0	0.003**
	Decreased	9	36.0	-	-		
TSH	Normal	17	68.0	20	100.0	7.78	0.005**
	Increased	8	32.0	-	-		
Insulin	Normal	19	76.0	20	100.0	5.54	0.02*
	Decreased	6	24.0	-	-		

P. 0.05→significant* P. 0.001 → High significant**

This table shows that patients had significantly higher frequency of cases with decreased T3, decreased T4, increased TSH and decreased insulin compared to controls.

Table-8 Correlation of T3 serum level (ng/dl) versus both age and sex among the diseased group

			Pearson's correlation	
			r	p
Age			0.23	0.27
			Student t test	
			t	p
Sex	Males	85.93 ± 36.18	0.071	0.94
	Females	84.9 ± 34.8		

This table shows that there is no significant correlation between serum T3 level , sex and age in the diseased group.

Table-9 Correlation between T3 serum level (ng/dl) versus anthropometric measures among the diseased group

	Pearson's correlation	
	r	p
Weight	0.41	0.045*
Weight z score	0.34	0.1
Height	0.29	0.16
Height z score	0.094	0.66
BMI	0.43	0.034*
BMI z score	0.25	0.23

This table(9) and figures (6,7) show that T3 serum level has a significant positive correlated with patients' weight and BMI. In addition there is correlation between T3 serum level and patients' height but statistically insignificant.

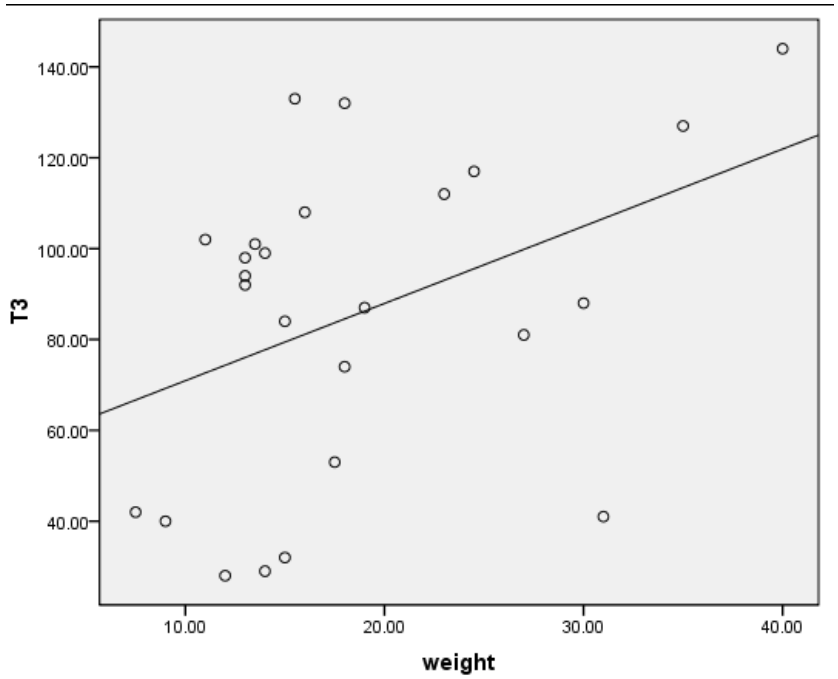

Fig. (6) Correlation between T3 serum level and weight

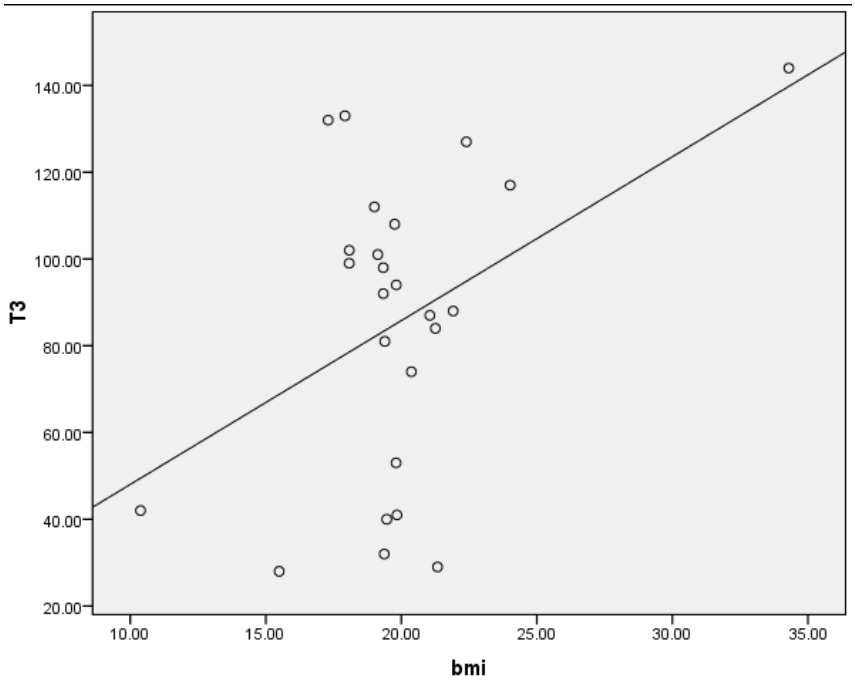

Fig. (7) Correlation between T3 serum level and BMI

Table-10 Correlation of T3 serum level (ng/dl) versus the clinical findings

			Pearson's correlation	
			r	p
Liver span			0.15	0.47
			Student t test	
			t	p
Splenomegaly	+	93.56 ± 37.31	0.86	0.4
	-	81.0 ± 33.9		
Muscular involvement	+	95.29 ± 35.41	0.87	0.39
	-	81.72 ± 34.98		
Cardiac involvement	+	75.67 ± 49.1	-0.51	0.61
	-	86.86 ± 33.88		
Renal involvement	+	83.67 ± 50.1	-0.096	0.92
	-	85.78 ± 34.0		

This table shows that there is no significant correlation between T3 serum level and clinical findings in the studied cases.

Table-11Correlation of T3 serum level (ng/dl) versus laboratory findings

			Pearson's correlation	
			r	p
T4			0.82	0.0001
TSH			-0.76	0.0001
Insulin			0.013	0.95
			Student t test	
			t	p
Liver enzymes	Normal	88.7 ± 42.99	0.28	0.78
	Elevated	84.28 ± 32.6		
Lipid profile	Normal	86.94 ± 33.1	0.32	0.75
	Abnormal	81.86 ± 41.83		
Anemia	Present	84.94 ± 34.61	-0.13	0.9
	Absent	87.0 ± 38.43		

This table shows that T3 serum level has a significant positive correlated with T4 serum level and significantly inversely correlated with TSH level. Nonetheless, no significant correlation is detected between T3 serum level, liver enzymes, hyperlipidemia and anemia.

Table-12 Correlation of T4 serum level (µg/dl) versus both age and sex among the diseased group

			Pearson's correlation	
			r	p
Age			0.26	0.2
			Student t test	
			t	p
Sex	Males	6.98 ± 4.0	-0.37	0.71
	Females	7.56 ± 3.52		

This table shows that there is no significant correlation between serumT4 level , sex and age in the diseased group.

Table-13 Correlation between T4 serum level (µg/dl) versus anthropometric measures among the diseased group

	Pearson's correlation	
	r	p
Weight	0.45	0.024*
Weight z score	0.38	0.61
Height	0.41	0.04*
Height z score	0.2	0.35
BMI	0.36	0.082
BMI z score	0.18	0.39

This table(13) and figures (8,9) show that serum T4 level has a significant positive correlated with patients' weight and height.

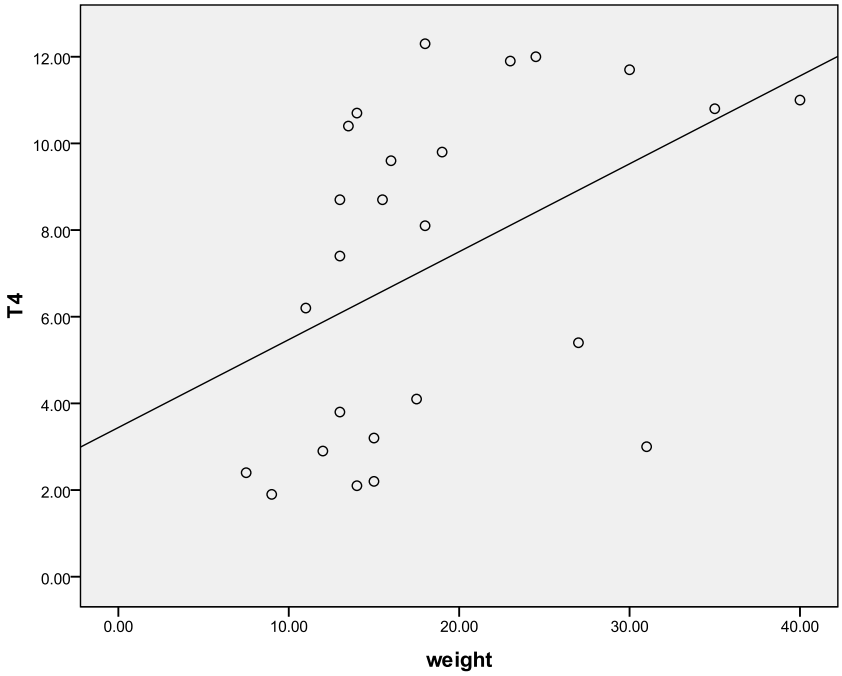

Fig. (8) Correlation between T4 serum level and weight

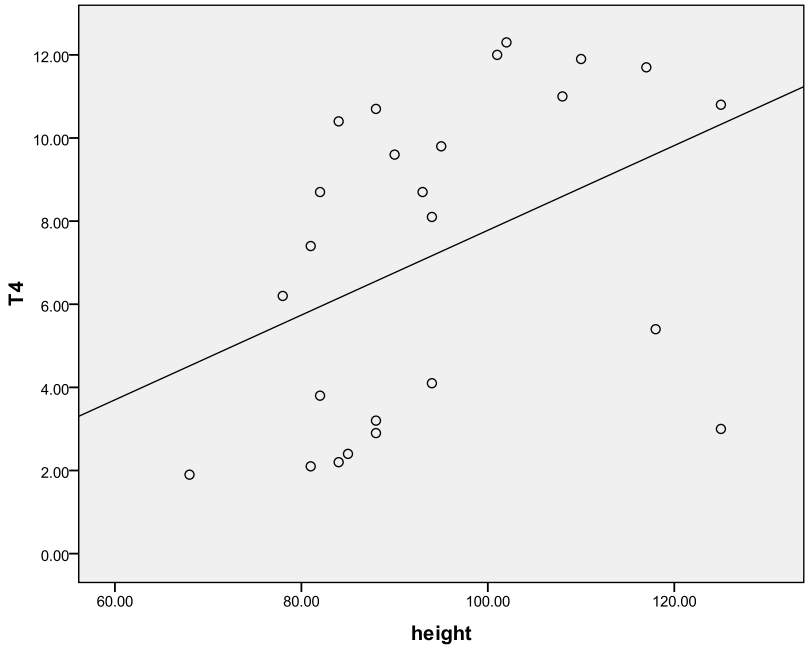

Fig. (9) Correlation between T4 serum level and height

Table-14 Correlation of T4 serum level (µg/dl) versus the clinical findings

			Pearson's correlation	
			r	p
Liver span (Hepatomegaly)			0.23	0.28
			Student t test	
			t	p
Splenomegaly	+	8.94 ± 3.9	1.81	0.084
	-	6.24 ± 3.41		
Muscular involvement	+	9.08 ± 3.45	1.61	0.12
	-	6.48 ± 3.7		
Cardiac involvement	+	6.27 ± 5.29	-0.46	0.65
	-	7.34 ± 3.65		
Renal involvement	+	8.43 ± 4.7	0.59	0.56
	-	7.05 ± 3.71		

This table shows that there is no significant correlation between T4 serum level and clinical findings in the studied cases.

Table-15 Correlation of T4 serum level (µg/dl) versus laboratory findings

			Pearson's correlation	
			r	p
T3			0.82	0.0001
TSH			-0.72	0.0001
Insulin			0.22	0.28
			Student t test	
			t	P
Liver enzymes	Normal	8.1 ± 4.15	0.73	0.47
	Elevated	6.87 ± 3.66		
Lipid profile	Normal	7.62 ± 3.57	0.87	0.39
	Abnormal	6.16 ± 4.31		
Anemia	Present	7.0 ± 3.77	-0.54	0.6
	Absent	7.87 ± 3.94		

This table shows that T4 serum level has significant positive correlation with T3 serum level and significantly inversely correlated with TSH level. Nonetheless, no significant correlation is detected between T4 serum level, liver enzymes, hyperlipidemia and anemia.

Table-16 Correlation of TSH serum level (µIU/ml) versus both age and sex among the diseased group

			Pearson's correlation	
			r	p
Age			0.7	0.74
			Student t test	
			t	P
Sex	Males	3.48 ± 2.05	-0.24	0.82
	Females	3.67 ± 1.86		

This table shows that there is no significant correlation between TSH serum level , sex and age in the diseased group.

Table-17 Correlation between TSH serum level (µIU/ml) versus anthropometric measures among the diseased group

	Pearson's correlation	
	r	p
Weight	-0.11	0.6
Weight z score	-0.33	0.11
Height	-0.091	0.67
Height z score	-0.30	0.15
BMI	-0.11	0.59
BMI z score	-0.16	0.46

This table shows that there is no correlations between TSH serum level and anthropometric measurements.

Table-18 Correlation of TSH serum level (µIU/ml) versus the clinical findings

			Pearson's correlation	
			r	p
Liver span			0.2	0.35
			Student t test	
			t	P
Splenomegaly	+	2.96 ± 1.76	-1.17	0.25
	-	3.89 ± 2.0		
Muscular involvement	+	3.3 ± 2.0	-0.4	0.69
	-	3.66 ± 1.96		
Cardiac involvement	+	4.67 ± 2.65	1.06	0.3
	-	3.4 ± 1.85		
Renal involvement	+	3.67 ± 2.3	0.1	0.92
	-	3.54 ± 1.95		

This table shows that there is no significant correlation between TSH serum level and clinical findings in the studied cases.

Table-19 Correlation of TSH serum level (µIU/ml) versus laboratory findings

			Pearson's correlation	
			r	p
T3			-0.76	0.0001
T4			-0.72	0.0001
Insulin			-0.27	0.19
			Student t test	
			t	p
Liver enzymes	Normal	3.57 ± 2.0	0.024	0.98
	Elevated	3.55 ± 1.97		
Lipid profile	Normal	3.3 ± 1.9	-1.04	0.31
	Abnormal	4.2 ± 2.03		
Anemia	Present	3.62 ± 1.92	0.25	0.81
	Absent	3.4 ± 2.15		

This table shows that serum TSH level has a significant inversely correlated with T3 and T4 serum levels. Nonetheless, no significant correlation is detected between TSH serum level, liver enzymes, hyperlipidemia and anemia.

Table-20 Correlation of insulin serum level (µIU/ml) versus both age and sex among the diseased group

			Pearson's correlation	
			r	p
Age			0.27	0.2
			Student t test	
			t	P
Sex	Males	3.69 ± 1.8	-0.57	0.57
	Females	4.09 ± 1.6		

This table shows there is no significant correlation between T3 serum level , sex and age in the diseased group.

Table-21 Correlation between insulin serum level (µIU/ml) versus anthropometric measures among the diseased group

	Pearson's correlation	
	r	p
Weight	0.29	0.16
Weight z score	0.21	0.31
Height	0.42	0.035*
Height z score	0.17	0.42
BMI	-0.029	0.89
BMI z score	0.2	0.35

This table(21) and figure(10) show that insulin level has a significant positive correlated with patients' height.

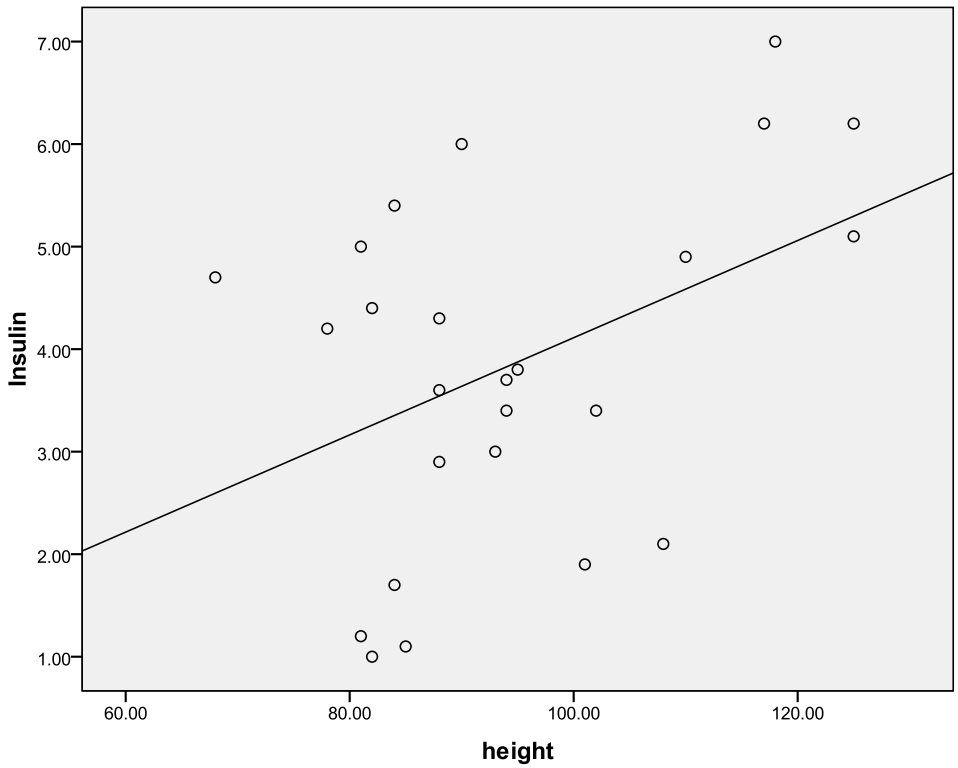

Fig. (10) Correlation between insulin serum level and height

Table-22 Correlation of serum insulin level (µIU/ml) to the clinical findings

			Pearson's correlation	
			r	p
Liver span			-0.094	0.66
			Student t test	
			t	P
Splenomegaly	+	4.32 ± 1.3	1.05	0.31
	-	3.58 ± 1.88		
Muscular involvement	+	3.74 ± 2.05	-0.19	0.85
	-	3.89 ± 1.61		
Cardiac involvement	+	2.73 ± 1.42	-1.22	0.24
	-	4.0 ± 1.71		
Renal involvement	+	3.83 ± 0.45	-0.02	0.99
	-	3.85 ± 1.82		

This table shows that there is no significant correlation between serum Insulin level and the clinical findings in the studied cases.

Table-23 Correlation of insulin levels versus the laboratory findings

			Pearson's correlation	
			r	p
T3			0.013	0.95
T4			0.22	0.28
TSH			-0.27	0.19
			Student t test	
			t	p
Liver enzymes	Normal	5.01 ± 1.7	1.32	0.29
	Elevated	3.39 ± 1.52		
Lipid profile	Normal	4.03 ± 1.9	0.84	0.41
	Abnormal	3.39 ± 0.99		
Anemia	Present	3.78 ± 1.77	-0.3	0.77
	Absent	4.01 ± 1.62		

This table shows that there is no significant correlations between serum insulin level and the laboratory findings.