Results

I. Presentation of Results:

Table 1: Comparison of age (years) among studied groups:

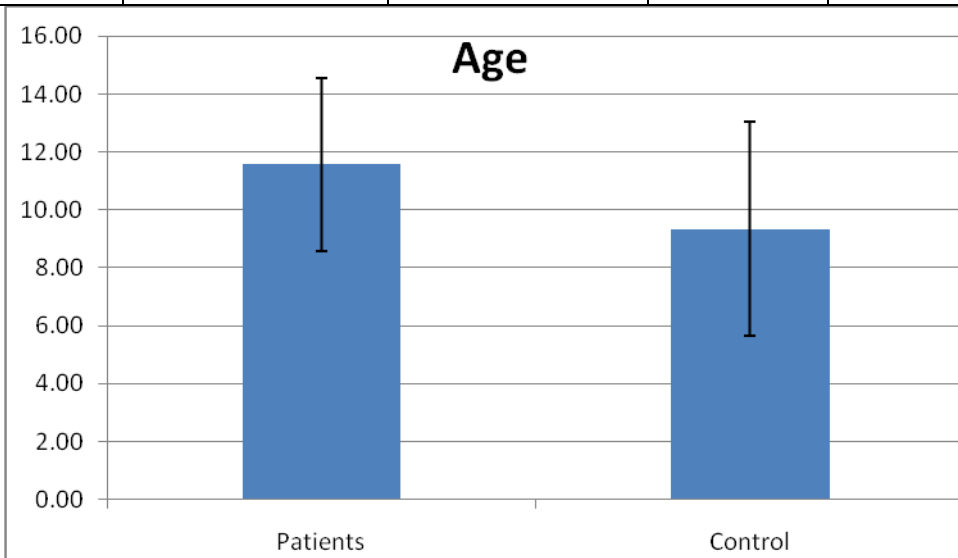|	Patients (n= 20)	Control (n= 16)	P value	Significance
Range	7.00-16.00	5.00-16.50	0.054	Insignificant
Mean±SD	11.58±2.99	9.34±3.71		

Figure 1: Comparison of age among studied groups.

Table 2: Comparison of weight (kg) among studied groups:

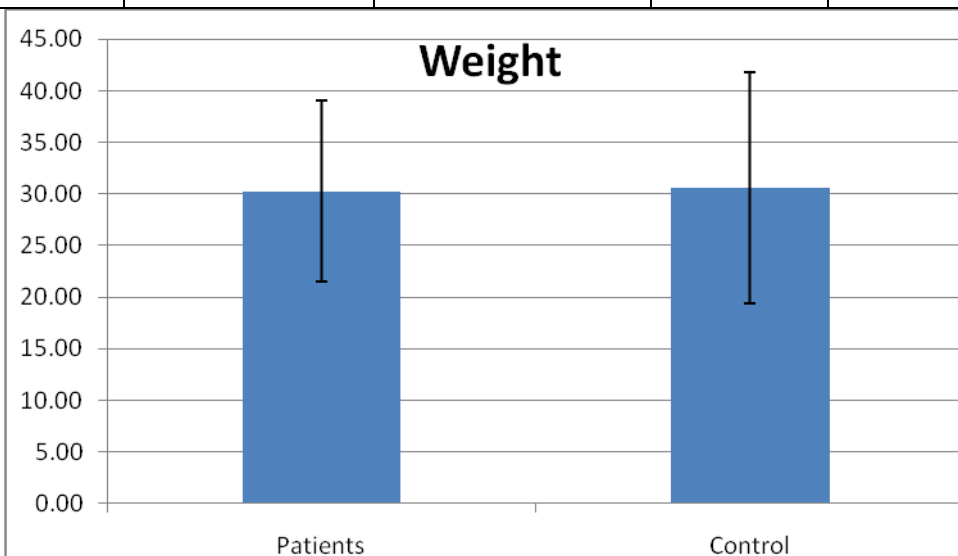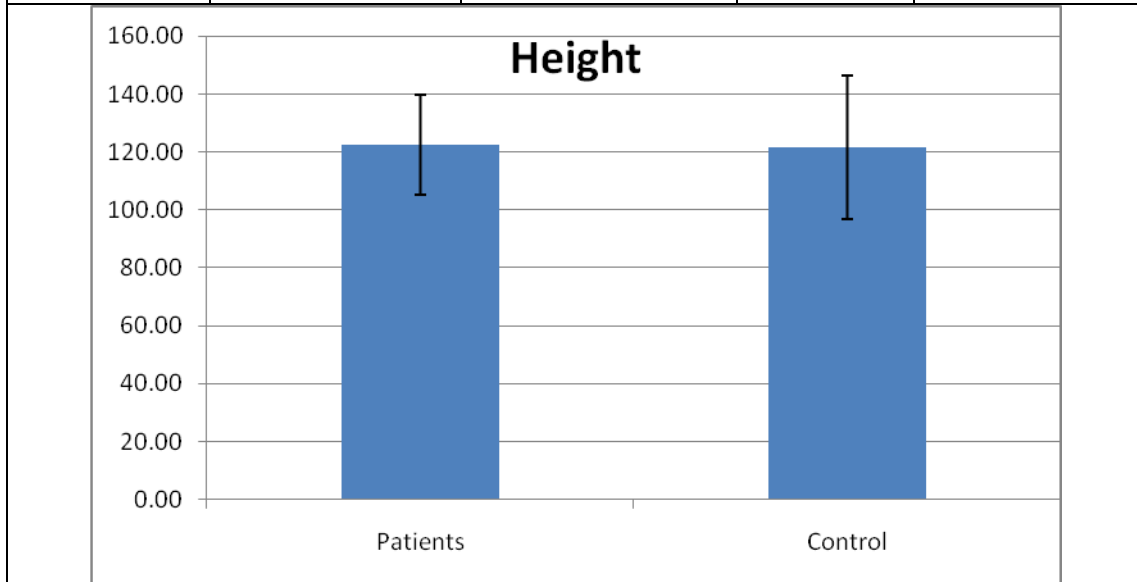|	Patients (n= 20)	Control (n= 16)	P value	Significance
Range	18.00-47.00	20.00-59.00	0.932	Insignificant
Mean±SD	30.28±8.81	30.56±11.19		

Figure 2: Comparison of weight among studied groups

Table 3: Comparison of height (cm) among studied groups:

	Patients (n= 20)	Control (n= 16)	P value	Significance
Range	99.00-166.00	85.00-165.00	0.909	Insignificant
Mean±SD	122.50±17.44	121.69±24.82		

Figure 3: Comparison of height among studied groups

Table 4: Comparison of systolic blood pressure (mmHg) among studied groups:

	Patients (n= 20)	Control (n= 16)	P value	Significance
Range	90.00-145.00	105.00-120.00	0.222	Insignificant
Mean±SD	118.42±15.19	113.44±5.39		

Table 5: Comparison of diastolic blood pressure (mmHg) among studied groups:

	Patients (n= 20)	Control (n= 16)	P value	Significance
Range	60.00-100.00	70.00-80.00	0.948	Insignificant
Mean±SD	76.75±10.67	76.56±4.73		

Table 6: Comparison of Blood urea nitrogen (BUN) (mg/dl) among studied groups:

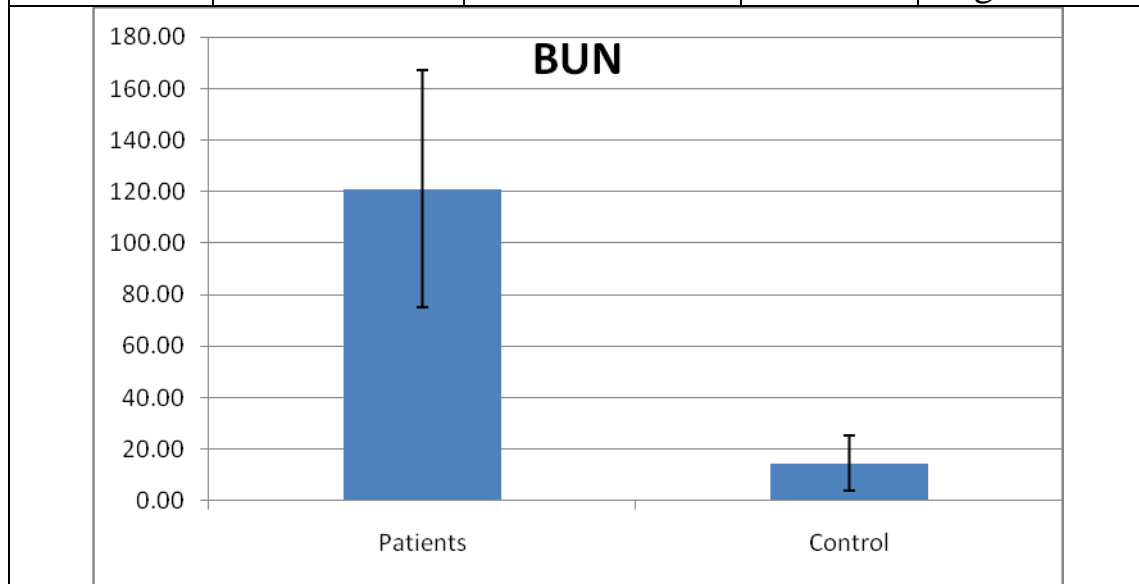|	Patients (n= 20)	Control (n= 16)	P value	Significance
Range	62.00-242.00	7.00-51.00	0.000	highly significant
Mean±SD	120.95±46.07	14.50±10.59		

Figure 4: Comparison of BUN among studied groups

Table 7: Comparison of serum creatinine (mg/dl) among studied groups:

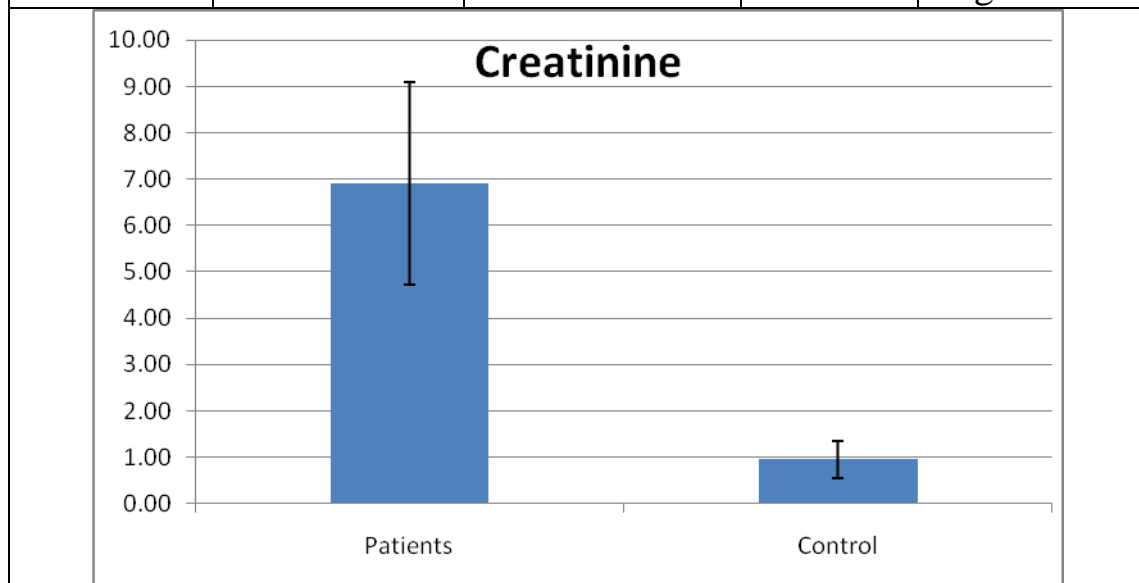|	Patients (n= 20)	Control (n= 16)	P value	Significance
Range	2.40-11.37	0.10-1.60	0.000	highly significant
Mean±SD	6.91±2.18	0.95±0.40		

Figure 5: Comparison of creatinine among studied groups

Table 8: Comparison of serum sodium (mmol/l) among studied groups:

	Patients (n= 20)	Control (n= 16)	P value	Significance
Range	130.00-178.00	132.00-159.00	0.141	Insignificant
Mean±SD	147.35±15.89	140.94±6.75		

Table 9: Comparison of serum potassium (mmol/l) among studied groups:

	Patients (n= 20)	Control (n= 16)	P value	Significance
Range	3.20-6.20	3.70-5.90	0.307	Insignificant
Mean±SD	4.88±0.76	4.63±0.66		

Table 10: Comparison of serum calcium (mg/dl) among studied groups:

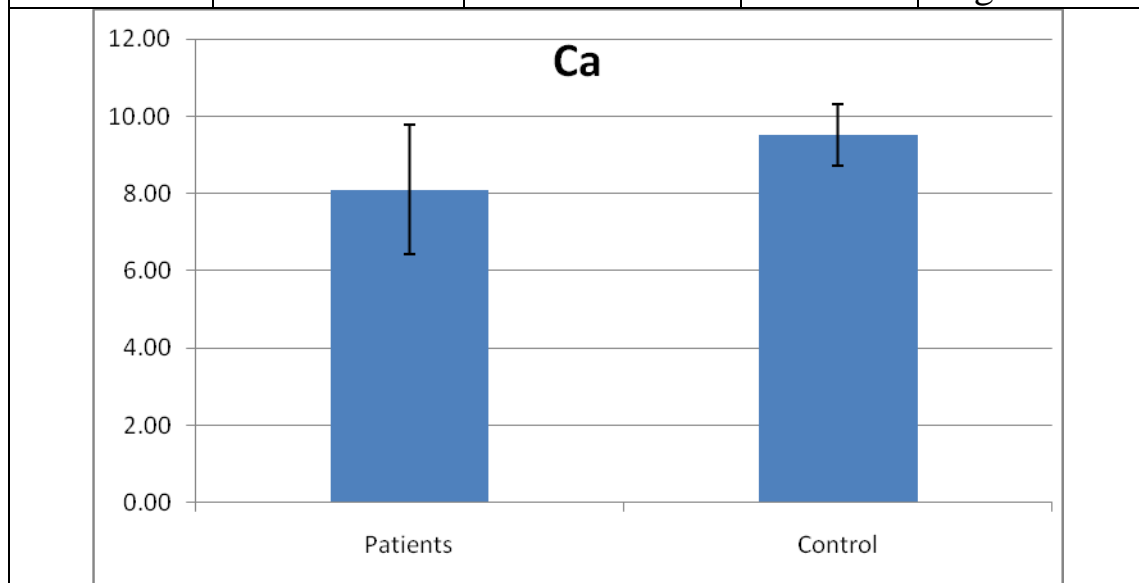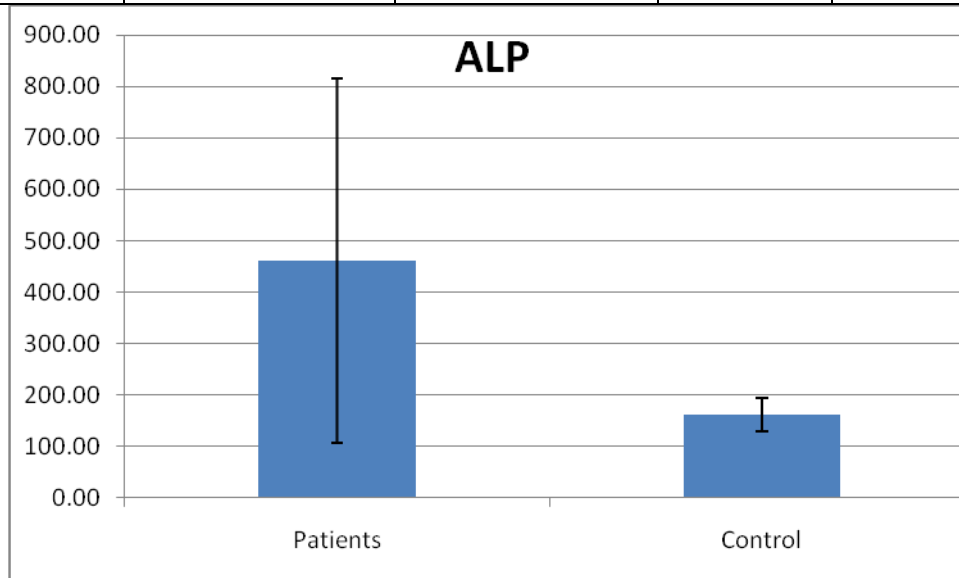|	Patients (n= 20)	Control (n= 16)	P value	Significance
Range	5.90-12.90	8.10-10.50	0.004	highly significant
Mean±SD	8.10±1.67	9.52±0.80		

Figure 6: Comparison of calcium among studied groups

Table 11: Comparison of serum phosphorus (mg/dl) among studied groups:

	Patients (n= 20)	Control (n= 16)	P value	Significance
Range	2.40-8.50	4.30-5.90	0.451	Insignificant
Mean±SD	5.39±1.50	5.09±0.47		

Table 12: Comparison of ALP (U/l) among studied groups:

	Patients (n= 20)	Control (n= 16)	P value	Significance
Range	157.00-1758.00	100.00-230.00	0.002	Highly significant
Mean±SD	460.90±355.18	161.31±33.52		

Figure 7: Comparison of ALP (U/l) among studied groups.

Table 13: Comparison of total protein (g/dl) among studied groups:

	Patients (n= 20)	Control (n= 16)	P value	Significance
Range	5.80-9.40	6.10-8.00	0.408	Insignificant
Mean±SD	7.34±0.84	7.13±0.62		

Table 14: Comparison of serum albumin (g/dl) among studied groups:

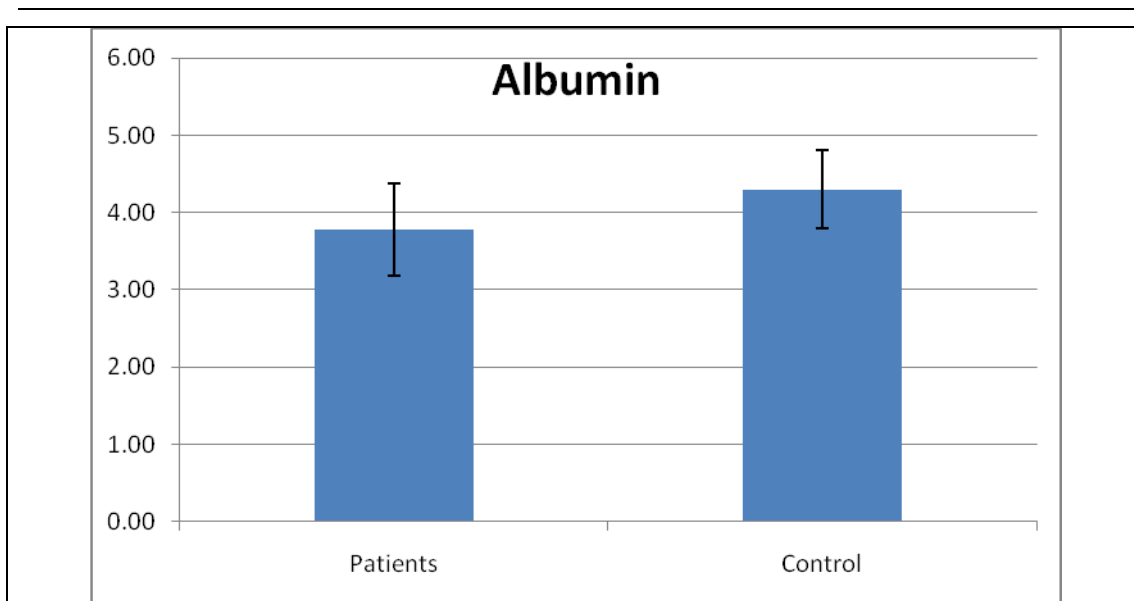|	Patients (n= 20)	Control (n= 16)	P value	Significance
Range	2.70-4.90	3.70-5.10	0.009	Highly significant
Mean±SD	3.78±0.59	4.30±0.51		

Figure 8: Comparison of albumin among studied groups

Table 15: Comparison of Hb (g/dl) among studied groups:

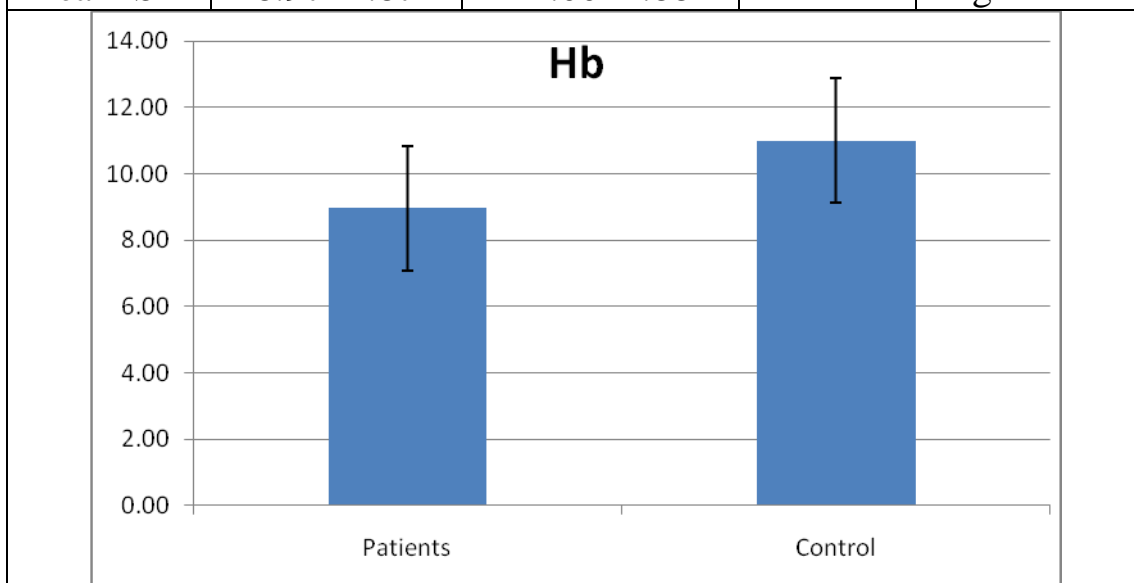|	Patients (n= 20)	Control (n= 16)	P value	Significance
Range	6.60-12.70	8.30-14.10	0.003	Highly significant
Mean±SD	8.97±1.87	11.00±1.88		

Figure 9: Comparison of Hb among studied groups

Table 16: Comparison of serum iron (mg/dl) among studied groups:

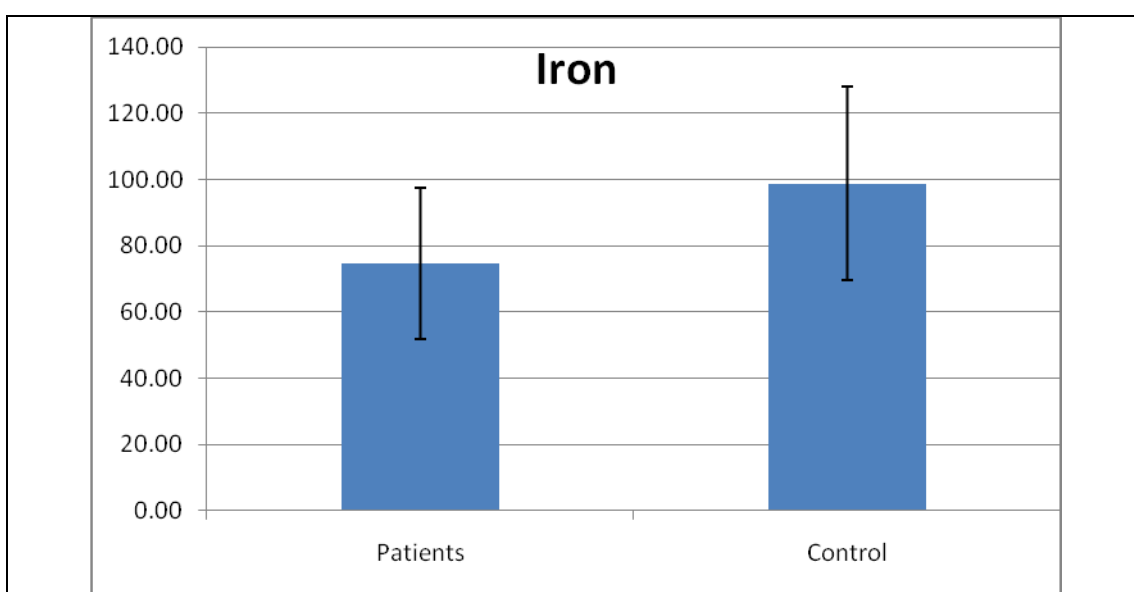|	Patients (n= 20)	Control (n= 16)	P value	Significance
Range	38.00-118.00	54.43-153.56	0.011	Significant
Mean±SD	74.50±22.88	98.81±29.34		

Figure 10: Comparison of iron among studied groups

Table 17: Comparison of TIBC among studied groups:

	Patients (n= 20)	Control (n= 16)	P value	Significance
Range	167.00-361.00	250-370	0.012	Significant
Mean±SD	256.29±58.29	300.74±26.37		

Table 18: Comparison of glomerular filtration rate (GFR) ml/minute among studied groups:

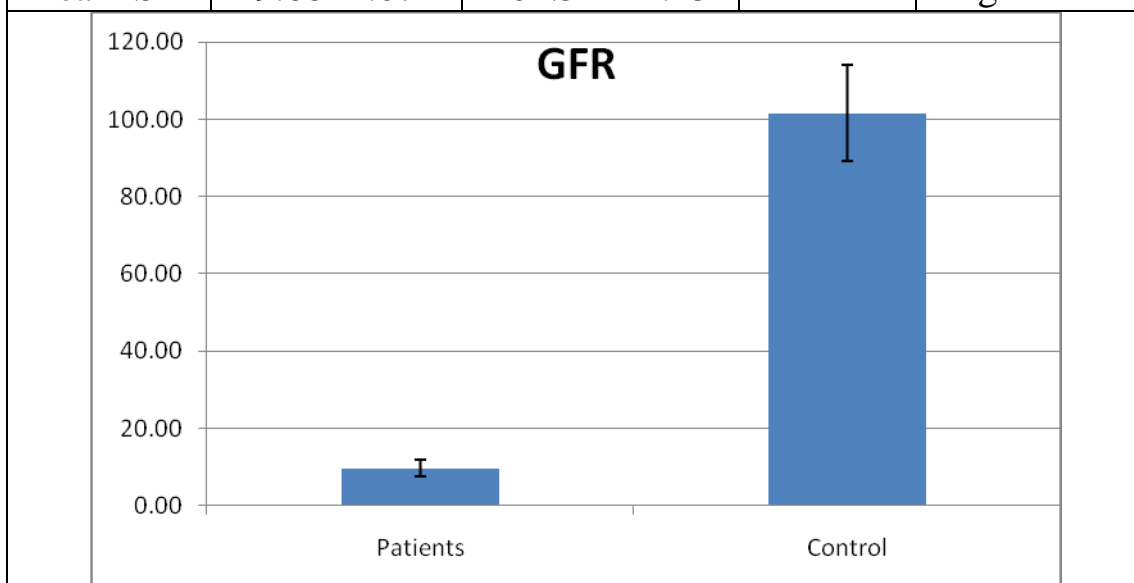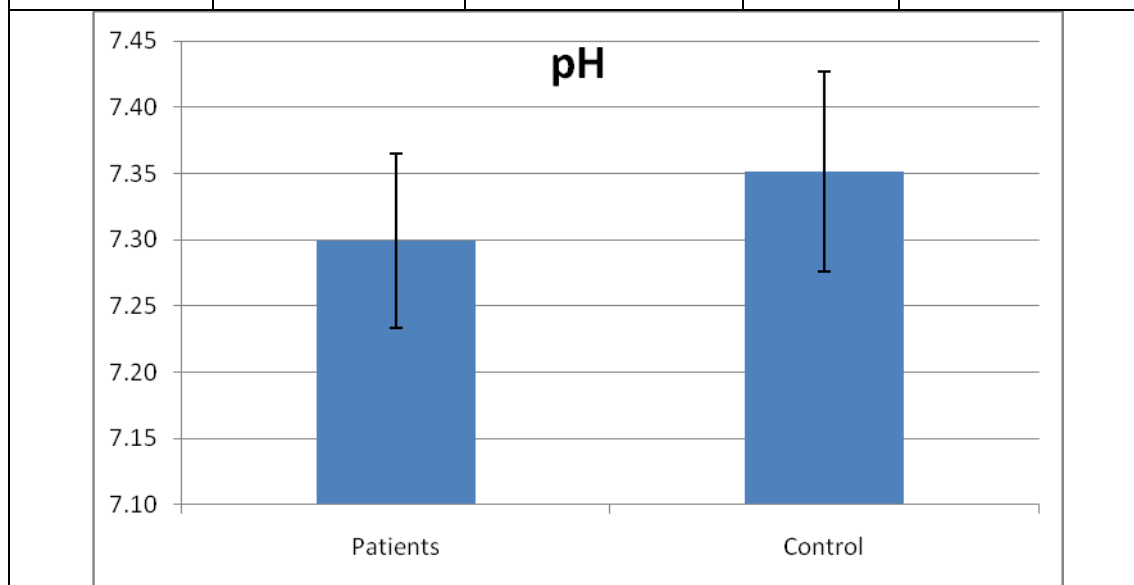|	Patients (n= 20)	Control (n= 16)	P value	Significance
Range	5.50-13.50	91.10-110.30	0.000	Highly signficant
Mean±SD	9.68±2.07	101.54±12.43		

Figure 11: Comparison of GFR among studied groups

Table 19: Comparison of blood pH among studied groups:

	Patients (n= 20)	Control (n= 16)	P value	Significance
Range	7.20-7.45	7.21-7.45	0.035	Significant
Mean±SD	7.30±0.07	7.35±0.08		

Figure 12: Comparison of pH among studied groups

Table 20: Comparison of HCO_3 among studied groups:

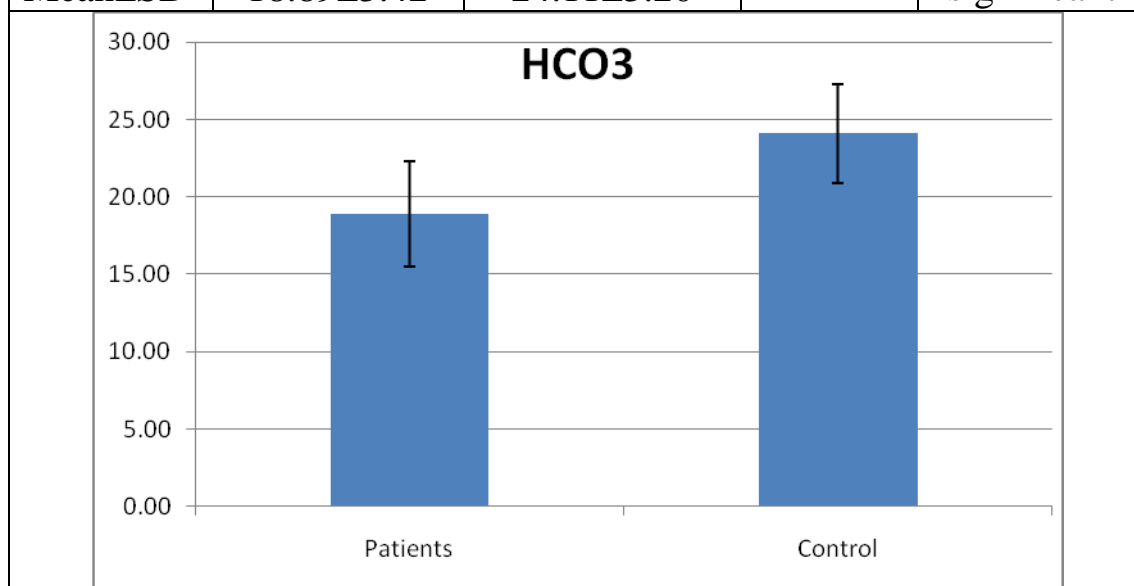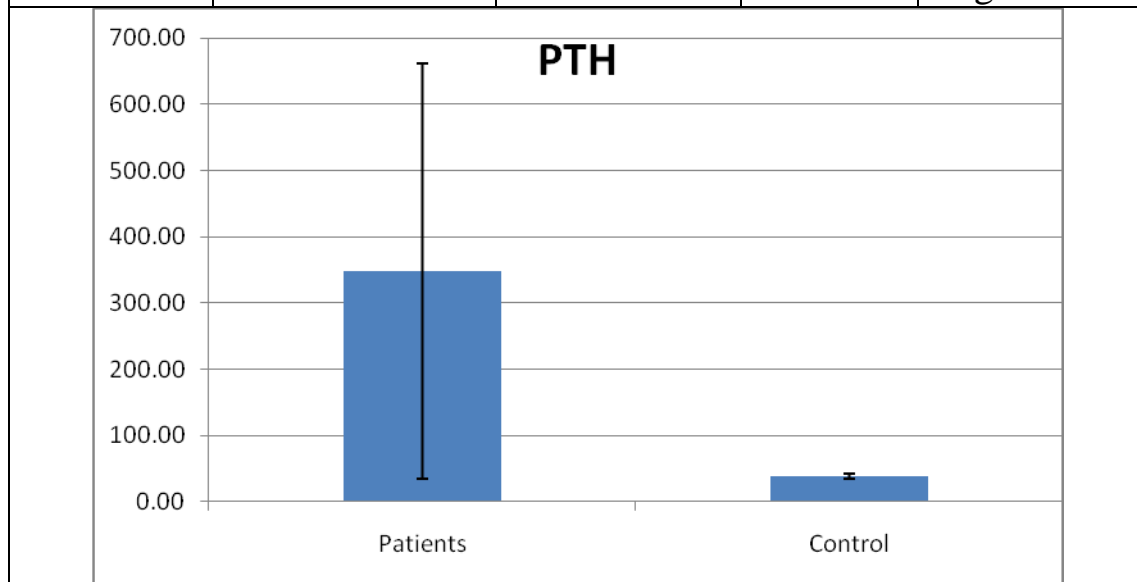|	Patients (n= 20)	Control (n= 16)	p value	Significance
Range	13.00-26.00	19.00-29.30	0.000	Highly significant
Mean±SD	18.89±3.42	24.11±3.20		

Figure 13: Comparison of HCO_3 among studied groups

Table 21: Comparison of PTH (pg/ml) among studied groups:

	Patients (n= 20)	Control (n= 16)	p value	Significance
Range	120.00-1138.00	31.44-43.05	0.002	Highly significant
Mean±SD	347.84±313.71	38.04±3.86		

Figure 14: Comparison of PTH among studied groups

Table 22: Comparison of serum PTH (pg/ml) , serum Calcium (mg/dl) and serum phosphorus (mg/dl) among patients with deformity and patients without deformity.

Parameter	No Deformity	Deformity	t-test	p-value
PTH	198.76±95.44	697.17±375.35	-4.777	000
Calcium	8.58±1.74	7.32±0.93	1.66	>0.05
Phosphorus	5.50±1.36	5.58±2.09	-0.107	>0.05

Table 23: patient characteristics, type of bone disease and laboratory paramaters.

NO	Age	Primary disease	Creatinine Mg/dl	Calcium Mg/dl	Phosphate Mg/dl	Alka Phospu/l	iPTH pg/ml	Radiology X-ray	Type of bone disea
1	10	HUS	4.6	8.9	4.9	417	312	Osteomalacia	Low turnover bon disease
2	16	Unknown	5.9	9.1	2.7	469	134	N0rmal	Low turnover bon disease
3	12	Hereditary	10.9	8.6	5.6	321	524	Active ROD	High turn over bon
4	14	PUV	7.5	6.8	3.4	718	984	Active ROD	High turn over bon
5	8	-	6.4	6.5	5.6	661	218	Normal	High turn over bon
6	13	TIN	7.7	8.9	4.3	455	198	Normal	Mixed bone diseas
7	12	TIN	6.7	8.7	5.8	376	487	Normal	High turn over bon
8	14	Alport	8.6	7.1	6.2	1758	1138	Active ROD	High turn over bon
9	15	RPGN	5.8	9.4	5.5	213	162	Normal	Mixed bone diseas
10	16	PUV	11.37	8.33	3.8	445	192.7	Nomal	Mixed bone diseas
11	7	Cystinosis	7.7	12.9	5.6	302	131	Normal	Low turnover bone disease
12	9.5	FGN	2.4	10.8	5.3	295	144	Normal	Low turnover bone disease
13	13.5	PCK	9.9	5.9	8.5	421	284	Active R0D	High turn over bon
14	9.5	UN	4.7	7.5	6.5	193	167	Normal	Low turnover bone disease
15	13	TIN	7.2	7.1	7.5	852	120	Normal	Mixed bone disease
16	7	UN	6.8	6.4	6	225	182	Rickets	Low turnover bone disease
17	11.5	Hereditary	7.4	6.7	5.2	157	163	Normal	Mixed bone diseas
18	9	Un	5.9	7.7	6	411	956	Active R0D	High turn over bon
19	9	UN	4.1	6.9	6	201	163	Normal	Low turnover bone disease
20	15	PCK	8.9	7.8	2.4	318	297	Active ROD	High turn over bon

PUV,posterior uretheral valve.PCK,polycyctic kidney,FGN.focal glomerulonephritis.HUS.hemolytic uremic syndrome.Alport syndrome.TIN,Tubulo-interstitial nephritis.UN,unknown.

Table 24: Type of bone disease and biochemical data of the patients

Bone disease	Calcium mg/dl	p-value	Phosphate mg/dl	p-value	Alk.Phosphatase	p-value	PTH	p-value
NO=8 HTO.	7.3±o.96	>0.o5	5.25±1.23	>0.05	623±311.2	<0.05	611±298.43	000
N0=7 LTO.	8.92±1.88	>.0.o5	5.27±2. 01	>.0.o5	300.2±102	>.0.o5	176.1±49.4	>0.05
N0=5 Mixed.	^ .08±1.3	>0.05	5. 26± 1. 49	>.0.o5	426.4±153	>.0.o5	167.1±38.2	>0.05

NO ,(number of the cases),HTO,(high turnover bone disease),LTO,(low turnover bone disease), MBD-(Mixed bone disease) P-value for comparison of each group(type of bone disease) with the rest of the patients.

Figure 15: Patient no 3 suffering from bone deformities in lower limb

Figure 16: Patient no 6 with right limb fissure.

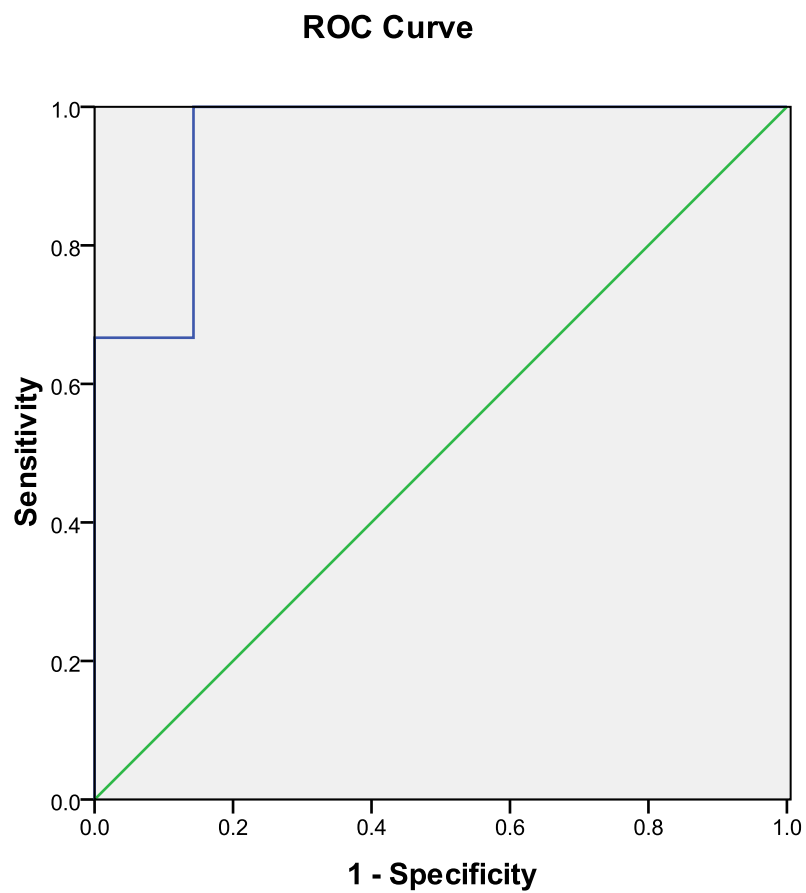**Figure 17 :** pat.no 12 with facial and right humerus deformity.

Figure 18: Right head of femur deformity of patient no 15.

Figure 19: Right polycystic kidney of patient no. 20.

Figure 20: Roc curve comparing PTH (sensitivity and specificity).

ROC Curve

Analysis of Results:

A. History:

1. Personal history:

i) Sex:

- Patients' group included 15 (75%) males, and 5 (25%) females.

- Control groups included 12 (75%) males, and 4 (25%) females.

ii) Age:

As shown in **table (1)**, age ranged from 7.00 to 16.00 years old with a mean of 11.58±2.99 in the patients' group, while in the control group, it ranged between 5.00-16.50 years old with a mean of 9.34±3.71 with insignificant statistical difference (t= 2.00; p-value = 0.054).

2. Present History:
Patients:

- All patients (100%) were on dialysis.

- Ten cases (5o%) complain of bone ache.

- Two cases(10%) complain of tenderness of the bone.

- None (0%) was on conservative treatment

- None (0%) of them was on any drugs.

3. Past History:
i) Patients:

- Two (10%) patients had past history of surgical procedures (apart from the kidney treatment).

- Five (25%) patients were delivered by cesarean section due to causes related to the mother.

- Only 2 (10%) patients were delivered by cesarean section due to distress.

ii) *Control:*

- One (2.5%) subject had past history of appendicectomy.
- None (0%) of them had taken any drugs.

B. Clinical examination:

1. General examination:

i) *Weight:*

As shown in **table (2)**, weight ranged from 18.00 to 47.00 Kg with a mean of 30.28±8.81 in the patients' group, while in the control group, it ranged between 20.00-59.00 Kg with a mean of 30.56+11,19 with insignificant statistical difference (t= -0.09; p-value = 0.932).

ii) *Height:*

As shown in **table (3)**, height ranged from 99.00 to 166.00 cm with a mean of 122.50±17.44 in patients' group, while in control group, it ranged between 85.00-165.00 cm with a mean of 121.69±24.82 with insignificant statistical difference (t= 0.12; p-value = 0.909).

iii) *Bone deformities:*

There were six cases (30%) from the patients' group with bony deformities , four cases (20%) from the six cases the deformity was in the lower limbs.

2. Systolic blood pressure:

As shown in **table (4)**, Systolic blood pressure ranged from 90.00 to 145.00 mmHg with a mean of 118.42±15.19 in the patients' group, while in the control group, it ranged between 105.00-120.00 mmHg, with a mean of 113.44±5.39 with insignificant statistical difference (t= 1.25; p-value = 0.222).

3. Diastolic blood pressure:

As shown in **table (5)**, Diastolic blood pressure ranged from 60.00 to 100.00 mmHg with a mean of 76.75±10.67 in the patients' group, while in the control group, it ranged between 70.00-80.00 mmHg, with a mean

of 76.56±4.73 with insignificant statistical difference (t= 0.07; p-value = 0.948).

C. Laboratory investigations:
1. Kidney functions:
i) BUN:

As shown in **table (6)**, BUN ranged from 62.00 to 242.00 mg/dl with a mean of 120.95±46.07 in patients' group, while in control group, it ranged between 7.00-51.00 mg/dl with a mean of 14.50±10.59.

On comparison between both groups, it was found that patients' group showed higher than the control group with highly significant statistical difference (t= 9.03; p-value = 0.000).

ii) Creatinine:

As shown in **table (7)**, serum creatinine ranged from 2.40 to 11.37 mg/dl with a mean of 6.91±2.18 in the patients' group, while in the control group, it ranged between 0.10-1.60 mg/dl with a mean of 0.95±0.40.

On comparison between both groups, it was found that patients' group showed higher level than the control group with highly significant statistical difference (t= 10.78; p-value = 0.000).

iii) Sodium:

As shown in **table (8)**, serum sodium ranged from 130.00 to 178.00 with a mean of 147.35±15.89 mEq/L in patients' group, while in control group, it ranged between 132.00-159.00 mEq/L with a mean of 140.94±6.75, with insignificant statistical difference (t= 1.51; p-value = 0.141).

iv) Potassium:

As shown in **table (9)**, serum potassium ranged from 3.20 to 6.20 mEq/L with a mean of 4.88±0.76 in patients' group, while in control group, it ranged between 3.70-5.90 mEq/L with a mean of 4.63±0.66, with insignificant statistical difference (t= 1.04; p-value = 0.307).

v) Calcium:

As shown in **table (10)**, serum calcium ranged from 5.90 to 12.90 mg/dl with a mean of 8.10±1.67 in patients' group, while in the control group, it ranged between 8.10-10.50 mg/dl with a mean of 9.52±0.80.

On comparison between both groups, it was found that patients' group calcium was lower than the control group with highly significant statistical difference (t= -3.12; p-value = 0.004).

vi) Serum Phosphorus:

As shown in **table (11)**, serum phosphorus ranged from 2.40 to 8.50 mg/dl with a mean of 5.39±1.50 in the patients' group, while in the control group, it ranged between 4.30-5.90 mg/dl with a mean of 5.09±0.47, with insignificant statistical difference (t= 0.76; p-value = 0.451).

2. Liver function tests:
i) ALP:

As shown in **table (12)**, serum ALP ranged from 157.00 to 1758.00 with a mean of 460.90±355.18 U/l in the patients' group, while in the control group, it ranged between 100.00-230.00 U/dl with a mean of 161.31±33.52, with highly significant statistical difference (t= 3.35; p-value = 0.002).

ii) Total Protein:

As shown in **table (13)**, serum total protein ranged from 5.80 to 9.40 g/dl with a mean of 7.34±0.84 in patients' group, while in control group, it ranged between 6.10-8.00 g/dl with a mean of 7.13±0.62, with insignificant statistical difference (t= 0.84; p-value = 0.408).

iii) Albumin:

As shown in **table (14)**, serum albumin ranged from 2.70 to 4.90 g/dl with a mean of 3.78±0.59 in the patients' group, while in the control group, it ranged between 3.70-5.10 g/dl with a mean of 4.30±0.51.

On comparison between both groups, it was found that patients' group showed lower levels than in the control group with highly significant statistical difference (t= -2.78; p-value = 0.009).

3. Anemia Profile:
i) Hb:

As shown in **table (15)**, Hb ranged from 6.60 to 12.70 g/dl with a mean of 8.97±1.87 in the patients' group, while in the control group, it ranged between 8.30-14.10 g/dl with a mean of 11.00±1.88.

On comparison between both groups, it was found that patients' group had lower Hb levels than the control group with highly significant statistical difference (t= -3.24; p-value = 0.003).

ii) Iron:

As shown in **table (16)**, serum Iron ranged from 38.00 to 118.00 mg/dl with a mean of 74.50±22.88 in the patients' group, while in the control group, it ranged between 54.43-153.56 mg/dl with a mean of 98.81±29.34.

On comparison between both groups, it was found that patients' group had lower levels than the control group with significant statistical difference (t= -2.71; p-value = 0.011).

iii) TIBC:

As shown in **table (17)**, serum TIBC ranged from 167.00 to 361.00 with a mean of 256.29±58.29 in the patients' group, while in the control group, it ranged between 250-370 with a mean of 300.74±26.37.

On comparison between both groups, it was found the patients' group showed lower levels than th-=p[-e control group with significant statistical difference (t= -2.83; p-value = 0.012).