

RESULTS

Ten normal children comprises group 1, 4 males and 6 females (4 - 12 years). Their serum copper (range 0.71 - 1.2 with a mean 0.93 ± 0.14 mg/L). Serum zinc (range 0.662 - 1.112 with a mean 0.85 ± 0.16 mg/L). Serum magnesium (range 1.603 - 2.302 with a mean 1.97 ± 0.23 mg/dL). these results are displayed in table (9).

The second group included ten patients with nephrotic syndrome; 6 males and 4 females (3.5 - 10 years). Their serum copper (range 0.208 - 1.35 with a mean 0.58 ± 0.323 mg/L). Serum zinc (range 0.172 - 0.450 with a mean 0.330 ± 0.080 mg/L). Serum magnesium (rang 0.903 - 1.952 with a mean 1.152 ± 0.301 mg/dL). The results are shown in table (10). Their serum creatinine ranged between 0.6 and 9.0 mg/dL with a mean 1.56 ± 2.618 mg/dL. Serum urea (rang 20.0 - 160.00 with a mean 52.0 ± 41.96 mg/dl). Serum protein (range 2.7 - 4.9 with a mean 3.55 ± 0.645 gm/dL). Serum albumin (range 1.5 - 3.1 with a mean 2.88 ± 0.539 gm/dL). the results are shown in table (8).

The third group included ten patients with acute glomerulonephritis: 4 males and 6 females (3-12 years). Their serum copper (range 0.762 - 1.93 with a mean $1.015 \pm$

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The third group included ten patients with acute glomerulonephritis: 4 males and 6 females (3-12 years). Their serum copper (range 0.762 - 1.93 with a mean $1.015 \pm$

0.138 mg/L). Serum zinc (range 0.292 - 0.706 with a mean 0.443 ± 0.128 mg/L). Serum magnesium (range 1.65 - 2.627 with a mean 1.87 ± 0.13 mg/dL). The results are shown in table (11). Their serum creatinine (range 0.6 - 2.6 with a mean 1.01 ± 0.66 mg/dL), serum urea (range 22 - 65 with a mean 40.5 ± 14.577 mg/dL), serum protein (range 5.6 - 6.9 with a mean 6.15 ± 0.353 gm/dL) and serum albumin (range 3.0 - 4.9 with a mean 3.6 ± 0.589 gm/dL). The results are shown in table (8).

The forth group included 10 patients with chronic renal failure; 7 males and 3 females (8 - 15 years). Their serum copper (range 0.978 - 1.780 with a mean 1.172 ± 0.2484 mg/L). Serum zinc (range 0.201 - 0.831 with a mean 0.5049 ± 0.1906 mg/L). Serum magnesium (range 2.304 - 3.103 with a mean 2.810 ± 0.2568 mg/dL). The results are shown in table (12).

Their serum creatinine (range 5.7 - 12.8 with a mean 10.12 ± 2.296 mg/dL). Serum urea (range 65.0 - 120.0 with a mean 83.3 ± 16.028 mg/dL). Serum protein (range 5.5 - 7.4 with a mean 6.270 ± 0.527 gm/dL). Serum albumin range 2.4 - 3.8 with a mean 3.02 ± 0.371 gm/dL). The results are shown in table (8).

- Table (1): Shows the clinical findings in normal control.
- Table (2): Shows the clinical findings in patients with nephrotic syndrome.
- Table (3): Shows the clinical findings in patients with acute glomerulonephritis.
- Table (4): Shows the clinical findings in patients with chronic renal failure.
- Table (5): Shows the laboratory findings in patients with nephrotic syndrome.
- Table (6): Shows the laboratory findings in patients with acute glomerulonephritis.
- Table (7): Shows the laboratory findings in patients with chronic renal failure.
- Table (8): Shows statistical analysis of serum creatinine, urea, protein and albumin in all patients.
- Table (9): Shows the levels of serum copper, zinc and magnesium in normal control.
- Table (10): Shows the levels of serum copper, zinc and magnesium in patients with nephrotic syndrome.
- Table (11): Shows the levels of serum copper, zinc and magnesium in patients with acute glomerulonephritis.
- Table (12): Shows the levels of serum copper, zinc and magnesium in patients with chronic renal failure.

Table (13): Shows:

- A significant decrease of serum copper in patients with nephrotic syndrome compared to normal control.
- A highly significant decrease of serum zinc and magnesium in patients with nephrotic syndrome compared to normal control.

Table (14): Shows:

- No significant difference between the level of serum copper and magnesium in patients with acute glomerulonephritis compared to normal control.
- A highly significant decrease of serum zinc in patients with acute glomerulonephritis compared to normal control.

Table (15): Shows:

- A significant increase of serum copper in patients with chronic renal failure compared to normal control.
- A highly significant increase of serum magnesium in patients with chronic renal failure compared to normal control.
- A highly significant decrease of serum zinc in patients with chronic renal failure compared to normal control.

Table (16): Shows:

- A highly significant increase of serum copper and magnesium in patients with chronic renal failure compared to patients with nephrotic syndrome.
- A significant increase of serum zinc in patients with chronic renal failure compared to patients with nephrotic syndrome.

Table (17): Shows:

- No significant difference between serum copper and zinc in patients with chronic renal failure and between serum copper and zinc in patients with acute glomerulonephritis.
- A highly significant increase of serum magnesium in patients with chronic renal failure compared to serum magnesium of patients with acute glomerulonephritis.

Table (18): Shows, the correlation between serum copper, zinc and magnesium in patients with nephrotic syndrome, acute glomerulonephritis and chronic renal failure and their serum creatinine, urea, protein and albumin.

Table (19): Shows the correlation between serum copper, zinc and magnesium of the total patients and between their serum creatinine and urea.

Figure (2): A histogram shows serum copper in control, nephrotic syndrome, acute glomerulonephritis and chronic renal failure groups.

Figure (3): A histogram shows, serum zinc in control, nephrotic syndrome, acute glomerulonephritis and chronic renal failure groups.

Figure (4): A histogram shows serum magnesium in control, nephrotic syndrome, acute glomerulonephritis and chronic renal failure groups.

Table (1): Clinical findings found in controls.

No.	Age (years)	Sex	Wt. (kg)	Bl. pr	Edema	Signs of heart failure	Neurological manifestations
1	9	male	23	100/70	-ve	-ve	-ve
2	7	female	20	90/70	-ve	-ve	-ve
3	10	female	30	100/70	-ve	-ve	-ve
4	4	male	17	85/60	-ve	-ve	-ve
5	4	female	16	90/65	-ve	-ve	-ve
6	5	male	17	85/65	-ve	-ve	-ve
7	12	female	35	100/70	-ve	-ve	-ve
8	8	female	25	90/70	-ve	-ve	-ve
9	5	male	17	80/60	-ve	-ve	-ve
10	6	female	21	90/65	-ve	-ve	-ve

Table (2): Clinical findings found in cases of nephrotic syndrome.

No.	Age (years)	Sex	Wt. (kg)	Bl. pr	Edema	Signs of heart failure	Neurological manifestations
1	6	male	21	90/70	++	-ve	-ve
2	9	female	28	100/75	+++	-ve	-ve
3	3.5	male	17	90/65	+++	-ve	-ve
4	8	male	25	100/70	+++	-ve	-ve
5	5	female	20	140/100	+++ with massive ascitis	-ve	-ve
6	4	female	17	90/60	++	-ve	-ve
7	4	female	16	90/70	++	-ve	-ve
8	5.5	male	20	90/70	++	-ve	-ve
9	10	male	32	120/80	+++	-ve	-ve
10	5	male	19	85/60	+++	-ve	-ve

Table (2): Clinical findings found in cases of nephrotic syndrome.

No.	Age (years)	Sex	Wt. (kg)	Bl. pr	Edema	Signs of heart failure	Neurological manifestations
1	6	male	21	90/70	++	-ve	-ve
2	9	female	28	100/75	+++	-ve	-ve
3	3.5	male	17	90/65	+++	-ve	-ve
4	8	male	25	100/70	+++	-ve	-ve
5	5	female	20	140/100	+++ with massive ascitis	-ve	-ve
6	4	female	17	90/60	++	-ve	-ve
7	4	female	16	90/70	++	-ve	-ve
8	5.5	male	20	90/70	++	-ve	-ve
9	10	male	32	120/80	+++	-ve	-ve
10	5	male	19	85/60	+++	-ve	-ve

Table (3): Clinical findings found in cases of acute
glomerulonephritis.

No.	Age (years)	Sex	Wt. (kg)	Bl. pr	Edema	Signs of heart failure	Neurological manifestations
11	7	female	18	110/80	++	-ve	-ve
12	9	male	20	110/80	+	-ve	-ve
13	3	female	12	120/80	+	-ve	-ve
14	8	female	16	110/70	+	-ve	-ve
15	12	female	32	140- 170/90	-ve	-ve	+ve hypertensive Encephalopathy
16	11	male	30	145/110	-ve	-ve	-ve
17	12	male	30	160/120	++	-ve	-ve
18	10	female	25	140/110	+++	-ve	-ve
19	4	male	17	120/80	+	-ve	-ve
20	3	female	15	100/60	++	-ve	-ve

Table (4): Clinical findings found in cases of chronic
renal failure.

No.	Age (years)	Sex	Wt. (kg)	Bl. pr	Edema	Signs of heart failure	Neurological manifestations
21	14	male	28	110/80	-ve	-ve	-ve
22	10	male	18	105/70	-ve	-ve	-ve
23	15	female	25	120/80	-ve	-ve	-ve
24	8	male	14	110/80	-ve	-ve	-ve
25	13	female	20	120/80	-ve	-ve	-ve
26	9	male	17	100/70	-ve	-ve	-ve
27	11	male	20	105/70	-ve	-ve	-ve
28	11	female	19	100/70	-ve	-ve	-ve
29	12	male	25	115/75	-ve	-ve	-ve
30	7	female	15	95/70	-ve	-ve	-ve

Table (5): Laboratory findings of cases of nephrotic syndrome.

No.	Hb. mg/dl	S.cr mg/dl	S.Ur. mg/dl	Protein total gm/dl	Albumin gm/dl	ESR	CS	U Vol, cc/24h	R Colour	I RBCS	N Protein	E Casts
1	11.5	0.8	40	3.9	2.9	60 80	130	1000	yellow	-ve	++	Hyaline granular
2	11	1.0	32	3.5	2.1	75 80	150	1500	yellow	-ve	+++	Hyaline granular
3	11.5	0.7	25	2.8	1.7	30 45	120	1000	yellow	5-10	+++	Granular fatty
4	11.5	0.6	67	2.7	1.5	45 65	95	400 oliguria	yellow	10-15	+++	Granular hyaline
5	10.5	9.0	160	3.9	2.7	25 40	105	50 oliguria	yellow turbid	10-12	++	Red cell hyaline granular
6	8	0.6	22	3.4	2.0	115 125	115	1000	dark yellow	-ve	++	Hyaline fatty
7	8.7	1.0	29	4.9	3.1	30 40	120	250 oliguria	yellow	6-8	++	-ve
8	11.5	0.6	20	3.0	1.9	120 122	180	1200	Turbid	-ve	+++	Hyaline granular
9	12	0.6	60	3.8	2.7	60 75	110	650 oliguria	Turbid	-ve	+++	Hyaline fatty
10	12.3	0.7	95	3.6	2.2	25 45	94	350 oliguria	Yellow turbid	5-10	+++	Hyaline granular

Table (6): Laboratory findings in cases of acute glomerulonephritis.

No.	Hb. gm/ dl	S.cr mg/dl	S.Ur. mg/dl	Protein total gm/dl	Albumin gm/dl	ESR	ASO IU/ ml	C3	U Vol. cc/24h	R Colour	I Hematuria	N Casts	E Prot- EIA	puss cells
11	10	0.7	22	6	4	27 64	400	18	570 (Olig.)	Dark red turbid	+ve macroscop.	Red cell	+	12-14
12	11.1	0.7	50	6.4	3.8	30 60	400	38	385 (Olig.)	Dark red turbid	+ve macroscop.	Red cell granular hyaline	+	35-401
13	8	0.7	32	6.2	3.1	35 72	400	70	470 (Olig.)	Dark red turbid	+ve macroscop.	Red cell granular	++	30-351
14	9	1.8	65	5.8	3.3	25 47	600	35	600 (Olig.)	Dark red	+ve macroscop.	Red cell granular	++	-ve
15	10	2.6	46	5.6	3.0	20 35	200	110	600 (Olig.)	Smoky	+ve macroscop.	Red cell granular	++	10-15
16	10	0.9	52	6.2	3.0	20 30	600	30	350	Brown	+ve macroscop.	Hyaline red cell	++	-ve
17	9	0.7	43	6.1	3.2	40 68	400	60	580	Smoky	+ve macroscop.	Red cell hyaline granular	++	35-40
18	8.5	0.7	25	6.3	3.8	17 32	200	115	400 (Olig.)	Dark red turbid	+ve macroscop.	Red cell granular	++	25-251
19	11	0.7	48	6.9	4.1	30 60	400	80	550	Yellowish	+ve macroscop.	Hyaline granular	+	35-401
20	11	0.6	22	6	4.79	30 60	200	75	400	Dark red turbid	+ve macroscop.	Red cell hyaline granular	+	25-301

Table (7): Laboratory findings of cases of chronic renal failure

No.	S.Cr. mg/dl	S.urea mg/dl	Na mEq/l	K mEq/l	Ca mg%	Ph. mg%	Protein Total gm/dl	Albumin gm/dl	Alk. phosph K, A, U%	Hb gm/dl
21	12.8	70	154.4	7.2	7.07	9.5	5.5	2.5	345	6.2
22	8.5	75	140.5	6.1	8.9	5.3	6.4	3.1	540	6.7
23	11.5	70	142.2	6.2	8.3	5.1	6.1	2.8	105	6.5
24	12.1	70	139.2	6.9	6.17	5.9	6.2	3.1	400	5.5
25	7.7	83	136.3	5.34	9.14	4.9	6.9	2.9	800	6.2
26	10.3	65	139.8	6.7	7.7	5.1	6.1	3.3	155	6.1
27	12.4	70	140.1	7.1	6.2	6	5.8	2.4	250	5
28	10.5	95	144.5	6.4	8.4	8.9	6.1	3.2	243	6.6
29	10.0	120	138	3.9	7.9	4.9	6.2	3.1	370	8
30	5.7	86	163	5.6	9	5.4	7.4	3.8	760	6.3

Table (8): Statistical analysis of serum creatinine, urea, protein and albumin of cases of
nephrotic syndrome, acute glomerulonephritis and chronic renal failure.

		Serum creatinine	Serum urea	Serum protein	Serum Albumin
	Range	0.6 - 9.0	20 - 160	2.7 - 4.9	1.5 - 3.1
Nephrotic syndrome	Mean	1.56	52	3.55	2.28
	S.D.	± 2.62	± 41.96	± 0.65	± 0.54
	Range	0.6 - 2.6	22 - 65	5.6 - 8.9	3 - 4.8
Acute Glomer ulonephritis	Mean	1.01	40.5	6.15	3.6
	S.D.	± 0.66	± 14.58	± 0.35	± 0.59
	Range	5.7 - 12.8	65 - 120	5.5 - 7.4	2.4 - 3.8
Chronic renal failure	Mean	10.12	83.30	6.27	3.02
	S.D.	± 2.296	± 16.028	± 0.53	± 0.37

Table (10): Serum copper, zinc and magnesium in patients with
nephrotic syndrome (group 2)

No	Cu mg/L	Zn mg/L	Mg mg/dL
1	0.654	0.372	1.121
2	0.465	0.292	1.102
3	0.390	0.394	1.008
4	0.208	0.256	0.903
5	1.351	0.450	1.310
6	0.836	0.315	1.052
7	0.603	0.351	1.952
8	0.307	0.172	1.013
9	0.543	0.301	1.003
10	0.458	0.398	1.063
Range	0.208-1.3510	0.1720-0.4500	0.9030-1.9520
Mean	0.5815	0.3301	1.1533
S.D.	± 0.3239	± 0.0805	± 0.3005

Table (11): Serum copper, zinc and magnesium in patients with
acute glomerulonephritis (group 3)

No	Cu mg/L	Zn mg/L	Mg mg/dL
11	1.064	0.545	2.027
12	1.193	0.376	1.816
13	1.080	0.386	1.989
14	0.892	0.292	1.760
15	0.762	0.343	1.991
16	0.880	0.352	1.830
17	1.184	0.436	1.740
18	0.995	0.706	1.842
19	1.099	0.409	1.652
20	1.005	0.580	2.004
Range	0.7620-1.1930	0.2920-0.7050	1.6520-2.0270
Mean	1.0154	0.4424	1.8651
S.D.	± 0.1384	± 0.1282	± 0.1304

Table (12): Serum copper, zinc and magnesium in patients with
chronic renal failure (group 4)

No	Cu mg/L	Zn mg/L	Mg mg/dL
21	1.780	0.201	3.103
22	1.002	0.693	2.950
23	0.362	0.453	3.003
24	1.304	0.429	2.802
25	1.038	0.701	3.054
26	1.022	0.521	2.502
27	1.106	0.303	2.752
28	1.054	0.442	2.304
29	1.082	0.475	2.959
30	0.978	0.831	2.680
Range	0.978-1.78	0.201-0.831	2.304-3.103
Mean	1.1728	0.5049	2.8109
S.D.	± 0.2487	± 0.1906	± 0.2573

Table (13): Statistical analysis of serum Cu., Zn and Mg
between group 1 and group 2.

	Cu	Zn	Mg
Group 1:			
Range	0.711-1.202	0.662-1.112	1.603-2.302
Mean	0.9364	0.8523	1.968
S.D.	± 0.1409	± 0.1581	± 0.2278
Group 2:			
Range	0.208-1.351	0.172-0.45	0.903-1.952
Mean	0.5815	0.3301	1.1533
S.D.	± 0.3239	± 0.0805	± 0.3005
t	3.1771	9.3079	6.8328
P	<0.01	<0.001	<0.001
Significance	Sig. ↓	H. Sig. ↓	H. Sig. ↓

Group 1: 10 controls.
Group 2: 10 patients with nephrotic syndrome.
Group 3: 10 patients with acute glomerulonephritis.
Group 4: 10 patients with chronic renal failure.
S.D. : Standard of deviation.
t : Test of significance.
P : Probability.
Sig. : Significant.
H. Sig. : Highly significant.
Not Sig.: Not significant.

Table (14): Statistical analysis of serum Cu., Zn and Mg between group 1 and group 3.

	Cu	Zn	Mg
Group 1:			
Range	0.711-1.202	0.662-1.112	1.603-2.302
Mean	0.9364	0.8523	1.968
S.D.	± 0.1409	± 0.1581	± 0.2278
Group 3:			
Range	0.762-1.193	0.292-0.705	1.652-2.027
Mean	1.0154	0.4424	1.8651
S.D.	± 0.1384	± 0.1282	± 0.1304
t	1.2662	6.3685	1.2398
P	<0.05	<0.001	<0.05
Significance	N.Sig.	H. Sig. ↓	N. Sig.

Table (15): Statistical analysis of serum Cu Zn and Mg between group 1 and group 4.

	Cu	Zn	Mg
Group 1:			
Range	0.711-1.202	0.662-1.112	1.603-2.302
Mean	0.9364	0.8523	1.968
S.D.	± 0.1409	± 0.1581	± 0.2278
Group 4:			
Range	0.978-1.78	0.201-0.831	2.304-3.103
Mean	1.1728	0.5049	2.8109
S.D.	± 0.2487	± 0.1906	± 0.2573
t	2.6157	4.4364	7.7572
p	<0.05	<0.001	<0.001
Significance	Sig. $\uparrow$	H. Sig. $\downarrow$	H. Sig. $\uparrow$

Table (16): Statistical analysis of serum Cu, Zn and Mg between group 2 and group 4.

	Cu	Zn	Mg
Group 2:			
Range	0.208-1.351	0.172-0.45	0.903-1.952
Mean	0.5815	0.3301	1.1533
S.D.	± 0.3239	± 0.0805	± 0.3005
Group 4:			
Range	0.978-1.78	0.201-0.831	2.304-3.103
Mean	1.1728	0.5049	2.8109
S.D.	± 0.2487	± 0.1906	± 0.2573
t	4.5787	2.672	13.2517
P	<0.001	<0.05	<0.001
Significance	H. Sig. $\uparrow$	Sig. $\uparrow$	H. Sig. $\uparrow$

Table (18): Correlation between serum copper, zinc and magnesium in patients with nephrotic syndrome, acute glomerulonephritis and chronic renal failure and between serum creatinine, urea, protein and albumin.

	Patients with nephrotic syndrome			Patients with acute glomerulonephritis			Patients with chronic renal failure		
	Cu	Zn	Mg	Cu	Zn	Mg	Cu	Zn	Mg
Serum creatinine	0.84	0.54	0.93	0.78	-0.51	0.13	0.89	-0.70	0.90
Serum urea	0.68	0.53	0.93	0.23	-0.84	0.63	0.13	-0.07	0.06
Serum protein	0.47	0.40	0.42	0.61	0.15	0.58	0.43	0.76	0.46
Serum albumin	0.53	0.43	0.41	0.34	0.61	0.11	0.61	0.18	0.04

N.B.:

More than 0.6 : Good correlation

0.4 - 0.6 : Fair correlation

0.1 - 0.4 : Weak correlation

Less than 0.1 : No correlation

Table (19): Correlation between serum copper, zinc and magnesium of the total patients and between serum creatinine and urea.

	Cu	Zn	Mg
Serum creatinine	0.54	0.33	0.84
Serum urea	0.18	0.03	0.50

N.B.:

More than 0.36 : Good correlation

0.2 - 0.36 : Fair correlation

0.05 - 0.2 : Weak correlation

Less than 0.05 : No correlation

(A)

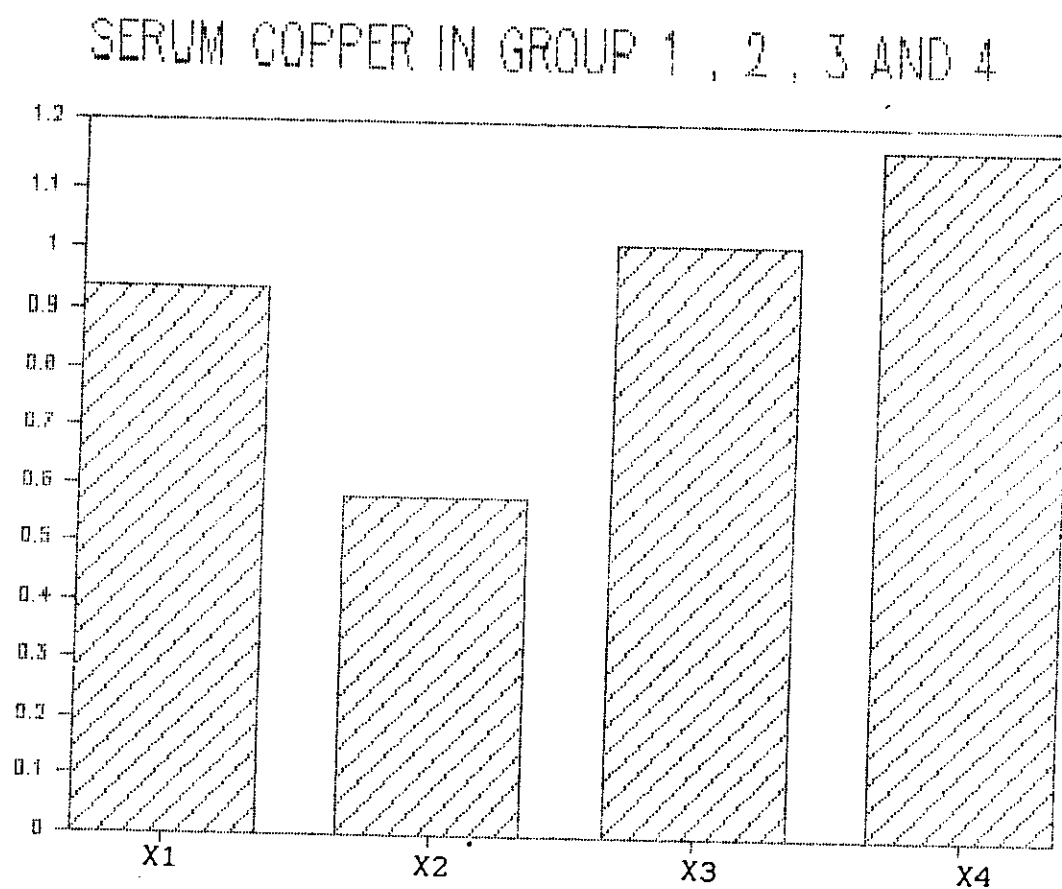


Figure (2)

N.B.:

- X1 - Normal control (group 1).
- X2 - Patients with nephrotic syndrome (group 2).
- X3 - Patients with acute glomerulonephritis (group 3).
- X4 - Patients with chronic renal failure (group 4).

SERUM ZINC IN GROUP 1 , 2 , 3 AND 4

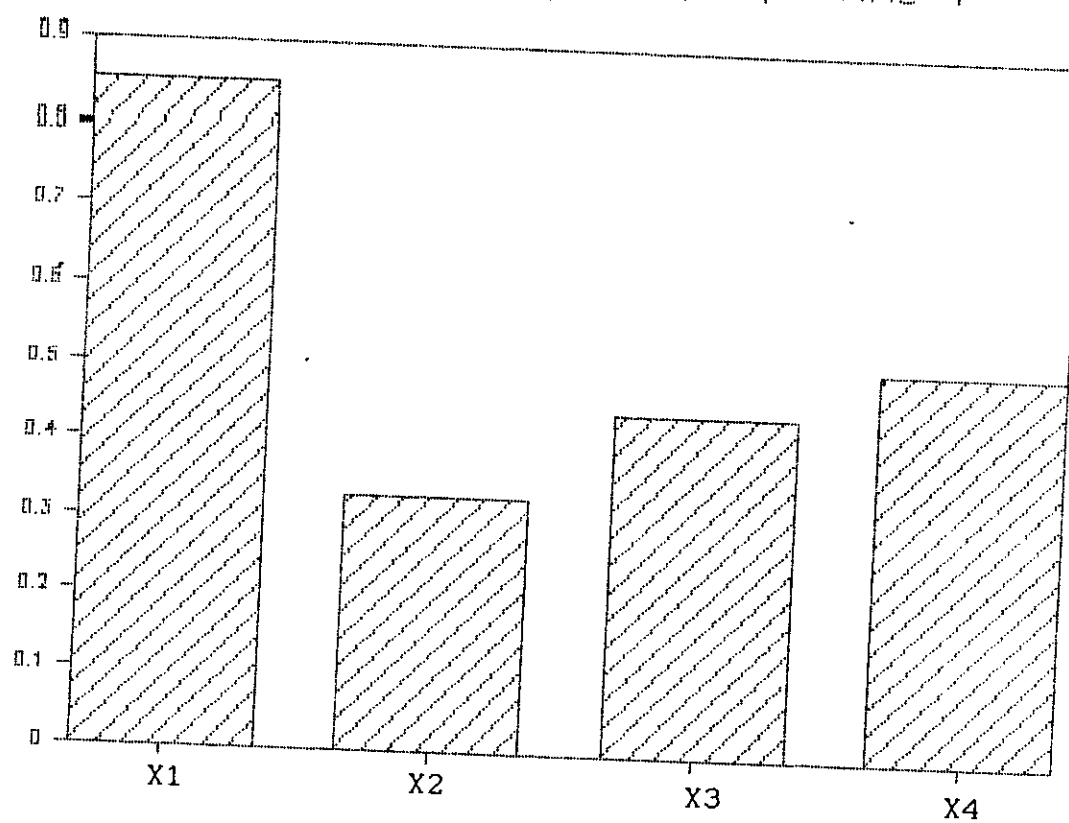


Figure (3)

SERUM MAGNESIUM IN GROUP 1, 2, 3 AND 4

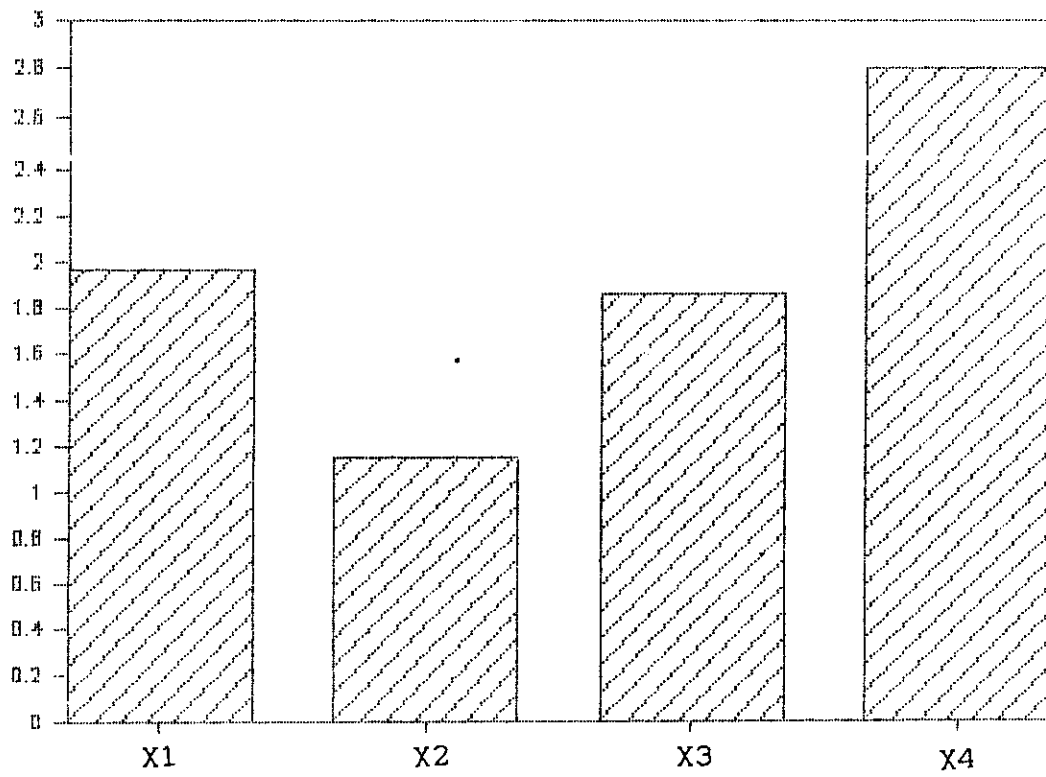


Figure (4)