Results

Our study subjects were divided as follow:

❖ Patients group

Comprised 30 SLE patients fulfilling at least 4 of the revised criteria of American Colleague of Rheumatology (ACR) (***Hochberg,1997***). They were receiving disease modifying anti-rheumatic drugs alone or combined with /or low dose corticosteroids.

All patients were females (100%), their ages ranged from 20 to 41 years (mean ± SD 30.26±4.89 years). Their disease duration ranged from 3 to 16 years (mean ± SD 13.63±9.3 years).

❖ Control group

Comprised 30 apparent healthy females (100%), their ages ranged from 20 to 45 years (mean ± SD 29.76±5.61years).

Patients and controls were age matched where t = 0.36 and p>0.05***(Table 1).***

- ***(Table2 and figure1):*** shows distribution of clinical findings in SLE patients.

  Thirteen patients (43.3%) had fever,10 patients (33.3%) had arthralgia /arthritis , 5 patients (16.6%) had serositis , 5 patients (16.6%) had pulmonary manifestation , 6 patients (20%) had cardiac manifestation and 8 patients (26.6%) had renal manifestation.

  Seventy-three percent of patients had mucocutaneous manifestation;18patients (60%) had photosensitivity and malar rash, 15 patients (50%) had alopecia, 10 patients (33.3%) had discoid rash and 4 patients (13.3%) had oral ulcers.

Twenty-three percent of patients had neurological manifestations;7 patients (23.3%) had headache, 3 patients (10%) had psychosis and 4patients(13.3%) had seizures.

Fifty percent of patients had hematological manifestation and were distributed as following; nine patients had (30%) anemia, 4 patients (13.3%) had leucopenia, 4 patients (13.3%)had lymphopenia and 5 patients had thrombocytopenia.

- ***Table (3):*** shows laboratory profile of SLE patients.

HB level ranged from 8 to 13 gm% (mean ±SD 10.48±1.59gm), RBCs count ranged from 3 to 5.2 cells/cmm (mean ± SD 3.98 ± 0.59cells/cmm),WBCs count ranged from 2.80 to 13 cells/cmm(mean ± SD 6.12±2.35cells/cmm), platelets count ranged from 112 to 354cells/cmm (mean± SD 245.7±70.33cells/cmm). ESR ranged from 5 to140 mm/1sthour (mean ±SD 64.37±41.72mm), serum creatinine ranged from 0.7 to 1.9 mg/dl (mean ± SD 0.91± 0.25mg/dl), complement 3 (C3) ranged from 35 to 160 mg/dl (mean ± SD 62.56 ± 34.76mg/dl) while C4 ranged from 4 to 30 mg/dl (mean ±SD 13.10 ±7.90mg/dl) and 24h protein in urine ranged from 400 to 2000 mg/dl (mean ± SD 596.66 ± 440.01mg/dl). The serum levels of 25(OH) vitamin D ranged from 5 to 62 ng/ml (mean ±SD 16.96±10.95ng/ml) while serum Ca levels ranged from 5.5 to 10.4 mg/dl (mean ± SD 7.63±1.36mg/dl) **.**

All SLE patients (100%) had positive ANA while 25 patients (83.3%) had positive Anti- ds DNA ***(Table 4 and Figure 2).***

SLE patients were classified according to their disease activity using SLEDAI score as follows;4patients (13.3%) had mild disease activity, 10 patients (33.3%) had moderate disease activity and16 patients (53.3%) had severe disease activity ***(Table 5 and Figure 3).***

SLE patients had significantly lower serum 25 (OH) vitamin D levels(16.96±10.96 vs. 41.60±8.17ng/ml) and serum Ca levels (7.63 ±1.36 vs. 9.62 ± 0.59mg/dl) than healthy controls, where t = 9.87 and 7.35 respectively and p < 0.001***(Table 6 and Figures 4,5)***.

- ***Table (7) and Figure (6)****:*show distribution of SLE patients according to vitamin D status.

Sixteen patients (53.3%) had deficient status, 9 (30%) had insufficient status and 5 patients (16.7%) had normal 25(OH) vitamin D levels.

- ***Table (8)****:* showsComparison between different 25(OH) vitamin D status and age among SLE patients.

The mean age of SLE patients with normal 25(OH) vitamin D serum levels was 30.28 (±5.22) years while it was 30.22 (±5.61) years in patient with insufficient status and it was 29.31 (±5.33) years in patients with deficient status. There were non statistical significant differences of ages among SLE patients with different vit D status (F= 3.32, P>0.05).

- ***Table (9):*** SLE disease activity grading in different 25(OH) vitamin D status.

Seventy five percent of patients with mild disease activity had deficient vitamin D and 25% of them had normal vitamin D levels, while

40% of moderate disease activity had insufficient vitamin D,30% had deficient levels and 30% had normal levels. On the other hand, 62% of patients with severe SLE had deficient vitamin D, 31% had insufficient levels and 7% had normal levels. A statistically significant relationship between 25(OH) vitamin D states and SLE disease activity were found, where χ^2 =5.44 and p <0.05 ***(Table9).***

- ***Table (10):***Shows comparison between the mean levels of serum 25(OH) vitamin D according to SLE manifestations.

Patients with photosensitivity and cardiac manifestations had highly statistical significantlylower levels of 25 (OH) vit. D(mean ±SD 19 ± 9.40 and 9.83±1.16ng/ml respectively), where p<0.001**.** Also, patients with renal and hematological manifestations as well as patients suffering from arthralgia/arthritis had statistically significant lower levels of 25 (OH) vit. D (mean ±SD 8.16±1.90, 22.10±11.50 and 23.70±11.92 ng/ml respectively), where p < 0.05**.**

On the other hand, non statistically significant differences of 25 (OH) vitamin D serum levels between patients with or without malar rash (mean ± SD 18.21±11.21ng/ml), oral ulcers (mean ± SD 16.00±12.72ng/ml), alopecia (mean ± SD 17.28±10.07ng/ml), serositis (mean ± SD 18.27±11.05ng/ml), pulmonary manifestations (mean ± SD 13.22±8.9 ng/ml) or neurological manifestations (mean ± SD 17.21±11.34ng/ml), where p >0.05.

SLE patients with deficient 25(OH) vitamin D status had highly statistical significantly lower WBCs count(mean ± SD 4.8± 1.84 cells/ cmm), platelets count (mean ± SD 140.25 ± 37.43 cells/cmm) and

C3 level(mean ±SD 14.41 ±18.48mg/dl), where p<0.001. Also they had statistically significant lower C4 level (mean ±SD 15.40 ± 19.10 mg/dl) , higher ESR 1st h (mean ±SD 101.25 ± 37.05 mm/h), where p<0.05. SLE patients with insufficient 25(OH) vitamin D status had significantly lower 24 h protein in urine (mean ±SD500.0±257.39mg/day), wherep<0.05. Non statistical significant differences among different 25(OH) vitamin D states as regards HB level, RBCs count and s.creatinine level were found (p >0.05) ***(Table 11).***

Although 12 (48%) patients with +ve anti–dsDNA had deficient 25(OH) vit. D state , 8(32%) patients had insufficient state and 5 (20%) patients had normal levels ,while 4(80%) patients with –ve anti–ds DNA had deficient state and one (20%) patient had insufficient state; a non statistical significant relationship among them has been reported (χ^2 =2.00 and p >0.05) ***(Table 12).***

SLE patients with deficient serum 25(OH) vitamin D had highly statistical significantly lower serum Ca levels (mean ±SD 6.73±0.93 mg /dl)than insufficient status (mean ±SD 8.0±0.43mg /dl) and normal status (mean ±SD 9.84±0.42mg /dl), where F= 33.77 and P < 0.001***(Table 13).***

- ***Table (14):*** Various SLE disease presentations VS serum 25(OH) vitamin D status.

Statistically significant relationships between low 25(OH) vitamin D level and cutaneous manifestations, arthritis, cardiac manifestations, renal

manifestations and hematological manifestationswere found (χ^2 = 11.48, 6.61, 5.67, 6.31 and 9.38 respectively) and p <0.05.

Non statistically significant relationships between low vitamin D level and fever ,serositis, pulmonary manifestations or neurological manifestations have been reported (χ^2 =2.65, 1.65, 1.33and 2.13 respectively) and p >0.05**.**

- ***Table(15) and Figures(7 - 10):*** Correlation coefficients of SLE disease parameters VS serum 25(OH) vitamin D levels.

There is a highly significant positive correlation between serum 25 (OH) vitamin D levels with serum ca levels (r = 0.79, p<0.001) and a highly significant inverse correlation with SLE disease activity (r = -0.47, p<0.001). Also, there are significant positive correlations with WBCs count (r= 0.58), platelets count (r= 0.79), C3(r=0.66) and C4 (r= 0.40), where p <0.05. There are significant inverse correlations with both ESR (r= -0.45) and 24h protein in urine(r= -0.36), where p <0.05. None significant correlations with SLE disease duration (r= 0.24), HB level (r=0.36), RBCs count (r= 0.33) or serum creatinine (r= -0.08); p>0.05, have been found.

- ***Table (16) and Figures(11-12):*** Correlation coefficients of SLE disease parameters VS serum Ca levels .

There is a highly significant negative correlation between serum Ca levels and SLE disease activity (r = -0.47, p<0.001). Also, there are significant positive correlations with WBCs count (r= 0.52), platelets

count (r= 0.73), C3(r=0.63) and C4 (r=0.35), where p <0.05. On the other hand, there are significant negative correlations between serum Ca with both ESR (r = -0.45) and 24 h urine protein in urine (r= -0.40), p <0.05.

None significant correlations with SLE disease duration (r= 0.25), HB level (r=0.11), RBCs count (r= 0.21) or serum creatinine (r= 0.13); p>0.05 , have been found.

Table (1): Age distribution among the studied groups

Age	Group1 (n=30)		Group2(n=30)	
	min	**max**	**min**	**max**
Range	20	41	20	45
Mean	30.26		29.76	
±SD	4.89		5.61	
t	0.36			
p	>0.05			

p value (>0.05): Non Significant

Table (2): Distribution of patients according to SLE manifestations

	N	%
Fever	13	43.3
Cutaneous manifestation: 1. Photosensitivity 2. Malar rash 3. Discoid rash 4. Oral ulcers 5. Alopecia	22 18 18 10 4 15	73.3 60 60 33.3 13.3 50
Arthralgria/arthritis	10	33.3
Serositis	5	16.6
Pulmonary manifestation (apart from serositis)	5	16.6
Cardiac manifestation (apart from serositis)	6	20
Renal manifestation	8	26.6
Neurological manifestation: 1. Headache 2. Psychosis 3. Seizures	7 7 3 4	23.3 23.3 10 13.3
Hematological manifestation: 1. Anemia 2. Leucopenia 3. Lymphopenia 4. Thrombocytopenia	15 9 4 4 5	50 30 13.3 13.3 16.6

N; Number of patients

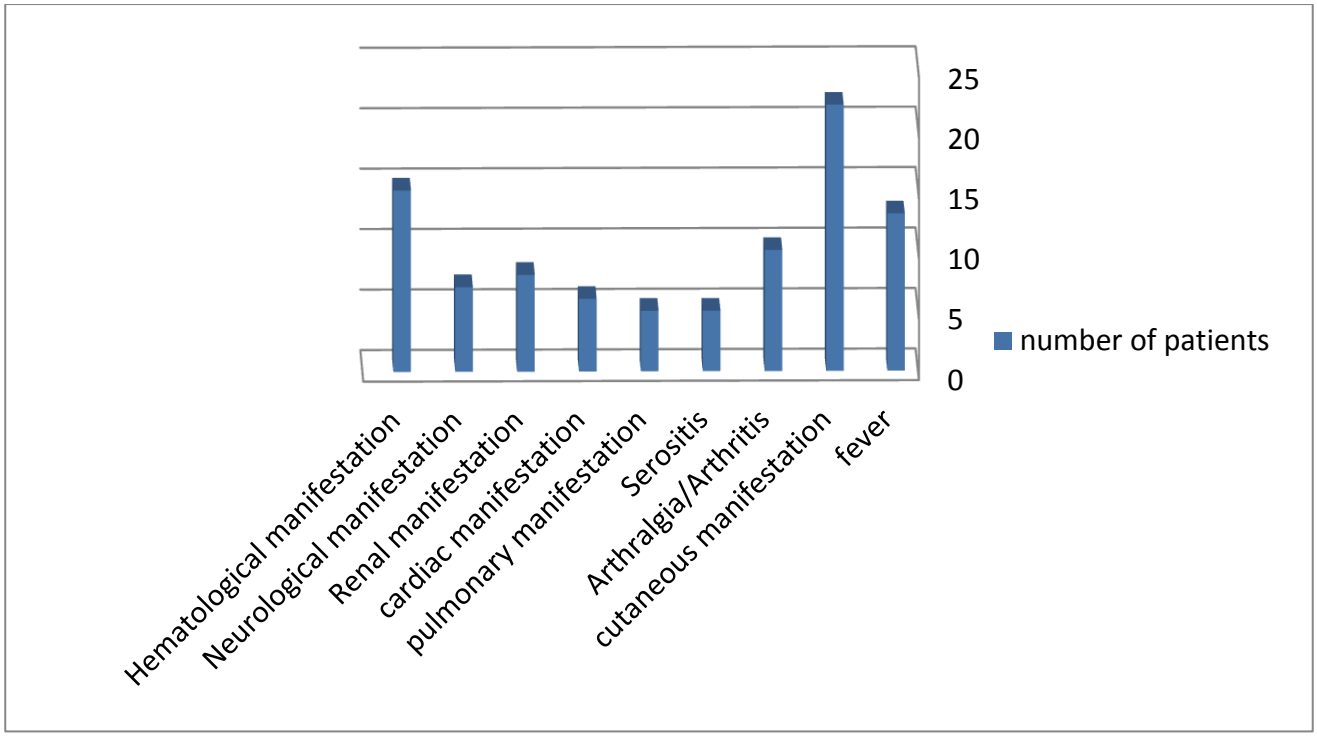


Figure (1): Distribution of patients according to SLE manifestations

Table (3): Laboratory profile of SLE patients.

	minimum	maximum	mean	±SD
CBC:				
1. HB(gm%)	8	13	10.48	1.59
2. RBC(cells/cmm)	3.00	5.20	3.98	0.59
3. WBC(cells/cmm)	2.80	13.0	6.12	2.35
4. Platlets (cells/cmm)	112.00	354.00	245.7	70.33
ESR (mm/1sthour)	5	140	64.37	41.72
S.creatinine(mg/dl)	0.7	1.9	0.91	0.25
C 3 (mg/dl)	35	160	62.56	34.76
C 4 (mg/dl)	4.0	30.0	13.10	7.90
24h protein in urine (mg/dl)	400	2000	596.66	440.01
25(OH) vitamin D(ng/ml)	5	62	16.96	10.95
Ca(mg/dl)	5.5	10.4	7.63	1.36

CBC: Complete blood cells.

HB: Hemoglobin.

RBC: Red blood cells.

WBC: White blood cells.

ESR: Erythrocyte sedimentation rate.

Sr.creatinine: Serum creatinine.

C3:Compelement 3.

C4:Compelement 4.

Ca: Calcium.

Table (4):Distribution of SLE patients according to the incidence of auto antibodies

	+ve		-ve	
	N	%	N	%
ANA	30	100	0	0
Anti- ds DNA	25	83.3	5	16.7

N; Number of patients.

ANA: Antinuclear antibodies.

Anti -dsDNA :Anti double stranded antibodies.

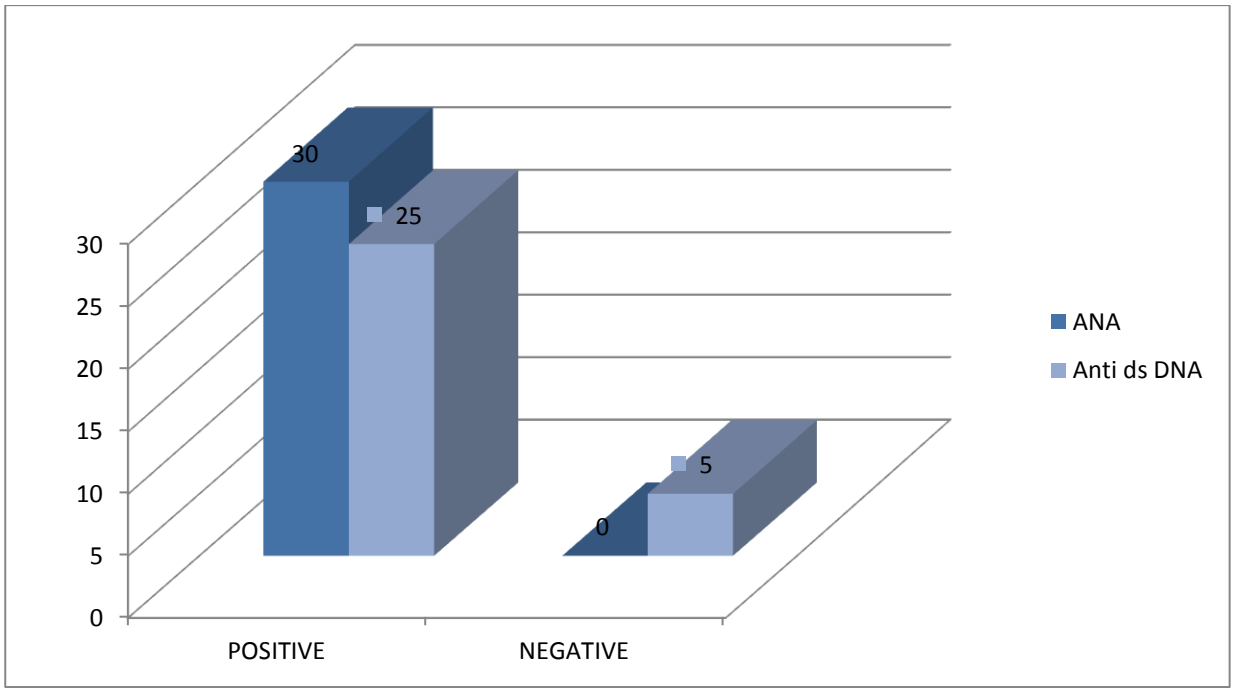


Figure (2) : Auto antibodies distribution of SLE patients **.**

Table (5): Distribution of SLE patients according to their disease activity.

	SLEDAI scores		
	Mild	**Moderate**	**Severe**
N	4	10	16
%	13.3	33.3	53.3

N; Number of patients.

SLEDAI: systemic lupus erthymatosus disease activity index.

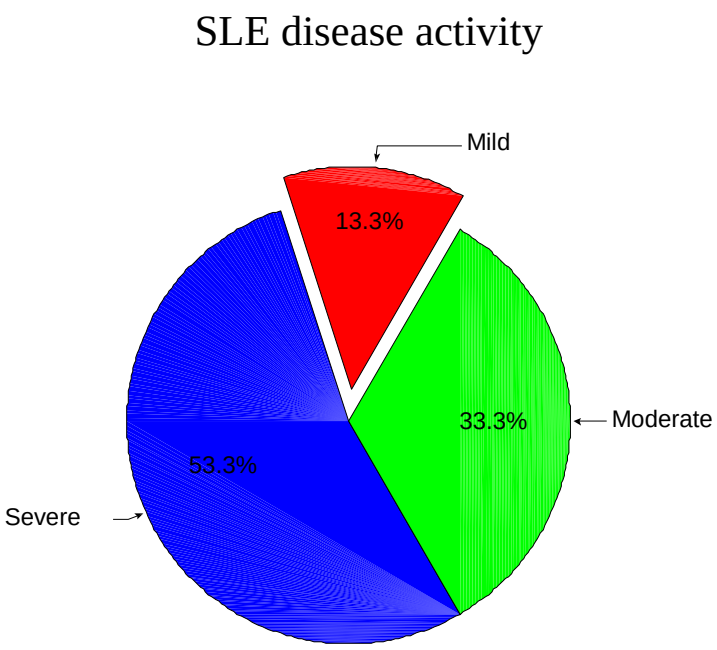


Figure (3) Distribution of SLE patients according to disease activity**.**

Table (6):Comparison of the mean serum levels of 25 (OH) vitamin D and Ca between patients and controls.

	Patients (N=30)	Controls (N=30)	t	P
	Mean ±SD	Mean ±SD		
25(OH)vitamin D (ng/ml)	16.96 ± 10.95	41.60 ± 8.17	9.87	<0.001**
Ca(mg/dl)	7.63 ±1.36	9.63 ± 0.59	7.35	<0.001**

N; Number of patients.

**p value (<0.001);Highly statistically significant.

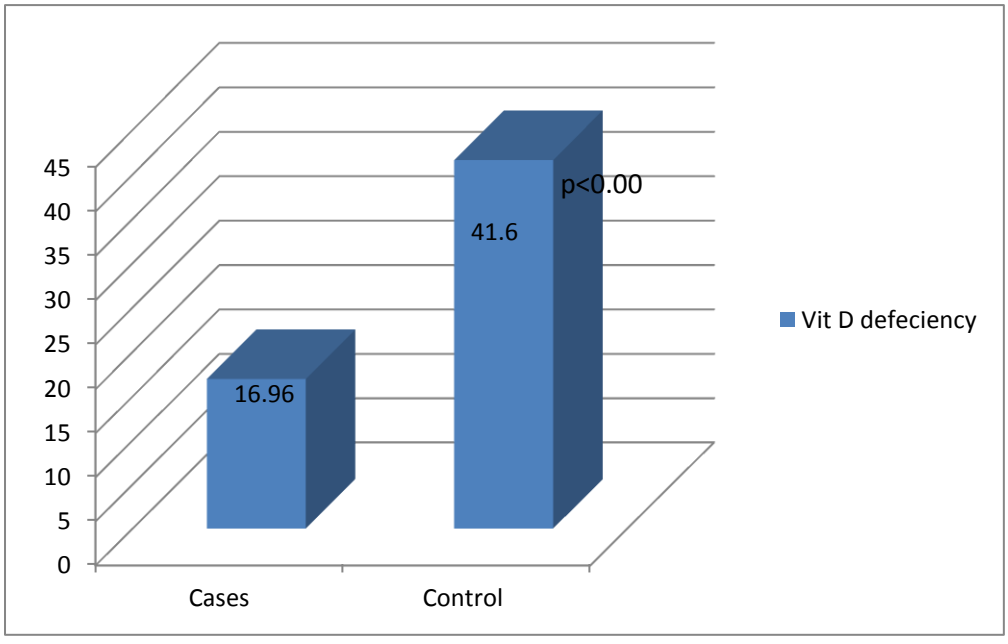


Figure (4): The mean serum levels of 25 (OH) vitamin D in SLE patients and controls.

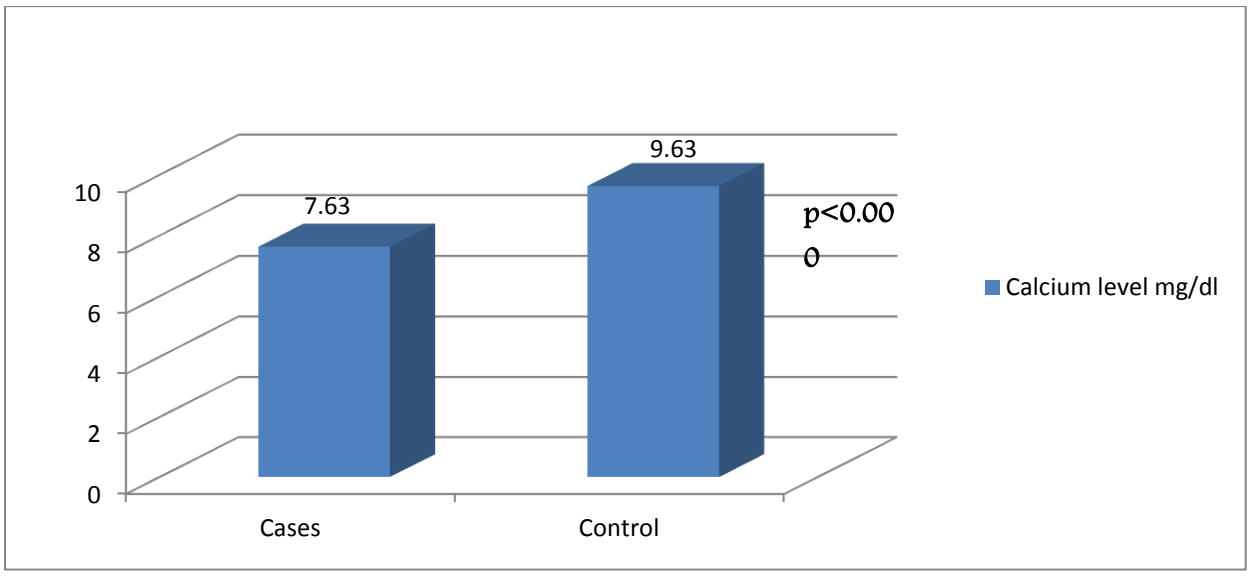


Figure (5): The mean serum Ca levels in SLE patients and controls**.**

Table (7):Distribution of SLE patients according to vitamin D status.

	25 (OH) Vitamin D status		
	Normal (vit D>30 ng/ml)	**Insufficiency (vitD10-30 ng/ml)**	**Deficiency (vit D<10 ng/ml)**
N	5	9	16
%	16.7	30	53.3

N; Number of patients.

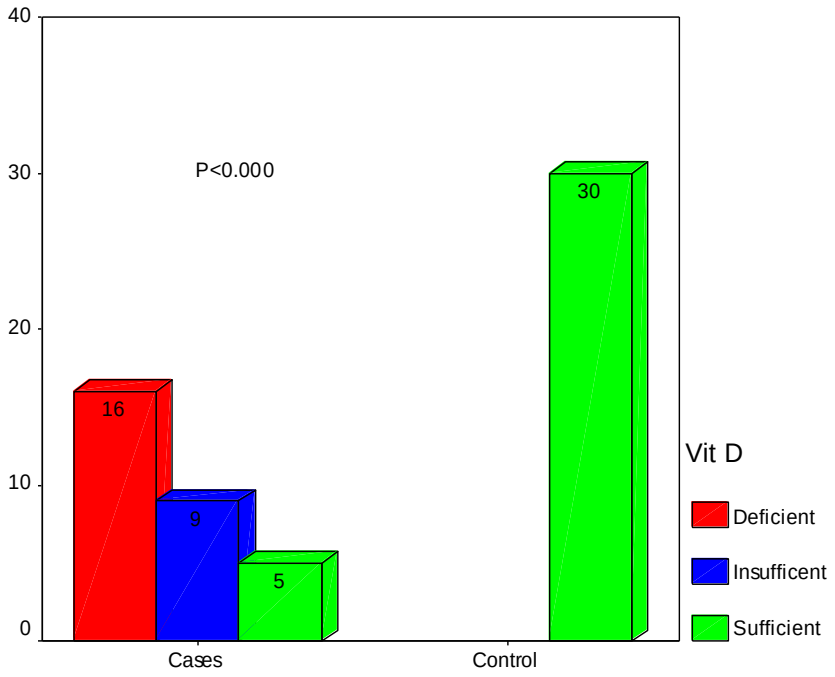


Figure (6): Distribution of SLE patients according to vitamin D status.

Table(8): Comparison between different 25(OH) vitamin D status and age among SLE patients.

Age (years)	25(OH) Vitamin D states		
	Normal (vit D>30 ng/ml) N=5	**Insufficiency (vitD10-30ng/ml) N=9**	**Deficiency (vitD<10ng/ml) N=16**
Mean	30.28	30.22	29.31
±SD	5.22	5.61	5.33
F	3.32		
P	>0.05		

N; Number of patients.

P value (>0.05): Non significant

Table (9): SLE disease activity grading in different 25(OH) vitamin D status.

SLEDAI score	25(OH)Vitamin D status							
	Deficiency (VitD<10ng/ml)		Insufficiency (VitD10-30ng/ml)		Normal (Vit D >30ng/ml)		χ^2	P
	N	%	N	%	N	%		
Mild	3	75	0	0	1	25	5.44	<0.05*
Moderate	3	30	4	40	3	30		
Severe	10	62	5	31	1	7		
Total	16	53.3	9	30	5	16.7		

*P value (<0.05); Significant.

N; Number of patients.

SLEDAI: systemic lupus erthymatosus disease activity index.

Table (10): Comparison between the mean levels of serum 25(OH) vitamin D according to SLE manifestations.

	25 (OH) Vitamin D serum levels			
	Negative findings Mean ± SD	**Positive findings Mean ± SD**	**t**	**P**
Cutaneous manifestation:				
*Photosensitivity	32.75 ± 10.48	19 ± 9.40	3.75	<0.001**
*Malar rash	15.08 ± 10.74	18.21 ± 11.21	0.76	>0.05
*Oral ulcers	17.10 ± 10.93	16.00 ± 12.72	0.18	>0.05
*Alopecia	13.81 ± 9.32	17.28 ±10.07	0.56	>0.05
Arthralgia/arthritis	13.59 ± 8.93	23.70 ± 11.92	2.61	<0.05*
Serositis	15.27 ± 10.06	18.27 ±11.05	0.56	>0.05
Pulmonary manifestations	18.31 ± 11.48	13.22 ± 8.92	1.13	>0.05
Cardiac manifestations	18.74 ± 11.59	9.83 ± 1.16	3.69	<0.001**
Renal manifestations	18.72 ± 11.17	8.16 ± 1.90	4.14	<0.05*
Neurological manifestations	14.07 ±9.65	17.21±11.34	0.75	>0.05
Hematological manifestations	33.63±9.5	22.10±11.50	2.81	<0.05*

**P value (<0.001):Highly statistically significant.

*P value (<0.05): Significant.

P value (>0.05): Non significant

Table (11): Comparison between laboratory profile in SLE patients with different 25(OH)vitamin D status.

	25(OH)Vitamin D states			ANOVA	
	Deficiency (VitD <10ng/ml) Mean ± SD	**Insfficiency (VitD10-30ng/ml) Mean ± SD**	**Normal (VitD>30ng/ml) Mean ± SD**	**F**	P
CBC					
***HB(gm%)**	10.80 ± 1.67	10.79 ± 1.31	11.86 ±1.12	2.47	>0.05
***RBC(cells/cmm)**	3.90 ± 0.92	3.77 ± 0.60	4.18 ± 0.37	1.50	>0.05
***WBC(cells/cmm)**	4.80 ± 1.84	5.10 ± 1.82	8.23 ± 1.93	9.61	<0.001**
***Platelet(cells/cmm)**	140.25 ± 37.43	257.00 ± 60.67	278.90 ±54.53	8.97	<0.001**
ESR(mm/h)	101.25 ± 37.05	72.55 ± 39.44	27.5 ± 18.5	7.17	<0.05*
S.creatinine (mg/dl)	1.03 ± 0.37	0.93 ± 0.32	1.00 ± 0.48	3.12	>0.05
C3 (mg/dl)	18.48 ±14.41	59.77±19.24	82.63 ± 38.46	3.68	<0.001**
C4(mg/dl)	19.10± 15.40	57.66±18.23	81.51 ± 32.51	3.51	<0.05*
24h protein in urine (mg/dl)	634.37 ± 419.41	500.0 ± 257.39	762.39±650.0	1.02	<0.05*

** P value (<0.001):Highly statistically significant.
* P value (<0.05): Significant.
P value(>0.05): non significant
CBC: Complete blood cells.
HB: Hemoglobin.
RBC: Red blood cells.
WBC: White blood cells
ESR: Erythrocyte sedimentation rate.
Sr.creatinine: Serum creatinine.
C3:Compelement 3.
C4:Compelement 4.

Table (12) :Anti –ds DNA positivity versus different 25(OH) vitamin D status in SLE patients

	25(OH)Vit. D status		
Anti-DNA	**Normal (VitD>30ng/ml)**	**Insufficiency (VitD10-30ng/ml)**	**Deficiency (Vit D<10ng/ml)**
Positive, n(%)	5 (20)	8 (32)	12 (48)
Negative, n(%)	0 (0)	1 (20)	4 (80)
χ^2	2.00		
P	>0.05		

P value (>0.05): Non significant

Table(13):Comparison between different serum 25(OH)vitamin D status and Ca levels among SLE patients.

	25(OH) Vitamin D level			ANOVA	
	Deficiency (Vit D <10ng/ml) Mean ±SD	**Insufficiency (vitD10-30ng/ml) Mean ±SD**	**Normal (vitD >30 ng/ml) Mean ±SD**	**F**	**P**
Serum Calcium (mg/dl)	6.73±0.93	8.0±0.43	9.84±0.42	33.77	<0.001**

**P value (<0.001):Highly statistically significant.

Table (14): Various SLE disease presentations VS serum 25 (OH) vitamin D status.

Clinical manifestation	Low Vit D level N	Normal Vit D level N	χ^2	P
Fever	8 (26.6%)	5 (16.6%)	2.65	>0.05
Cutaneous manifestations	16 (53.3%)	6 (28%)	11.48	<0.05*
Arthralgia/Arthritis	7 (23.3%)	3 (10%)	6.61	<0.05*
Serositis	1 (3.3%)	4 (13.3%)	1.65	>0.05
Pulmonary manifestations	3 (10%)	2 (6.6%)	1.33	>0.05
Cardiac manifestations	4 (13.3%)	2 (6.6%)	5.67	<0.05*
Renal manifestations	7 (23.3%)	1 (3.3%)	6.31	<0.05*
Neurological manifestations	5 (16.6%)	2 (6.6%)	2.13	>0.05
Hematological manifestations	10 (33.3%)	5 (16.6%)	9.38	<0.05*

**P value (<0.001):Highly statistically significant.

*P value (<0.05): Significant.

P value (>0.05): Non significant

Table(15): Correlation coefficients of SLE disease parameters VS serum 25(OH) vitamin D levels.

SLE disease parameters	Vitamin D	
	r	p
Disease duration (months)	0.24	>0.05
HB (gm %)	0.36	>0.05
RBCs (cells/cmm)	0.33	>0.05
WBCs (cells/cmm)	0.58	<0.05*
Platelets(cells/cmm)	0.79	<0.05*
ESR(mm/h)	- 0.45	<0.05*
Serum C3(mg/dl)	0.66	<0.05*
Serum C 4(mg/dl)	0.40	<0.05*
24h protein in urine (mg/dl)	-0.46	<0.05 *
Serum creatinine(mg/dl)	-0.08	>0.05
SLEDAI score	-0.47	<0.001**
Ca (mg/dl)	0.79	<0.001**

**P value (<0.001):Highly statistically significant.

*P value (<0.05): Significant.

P value (>0.05): Non significant

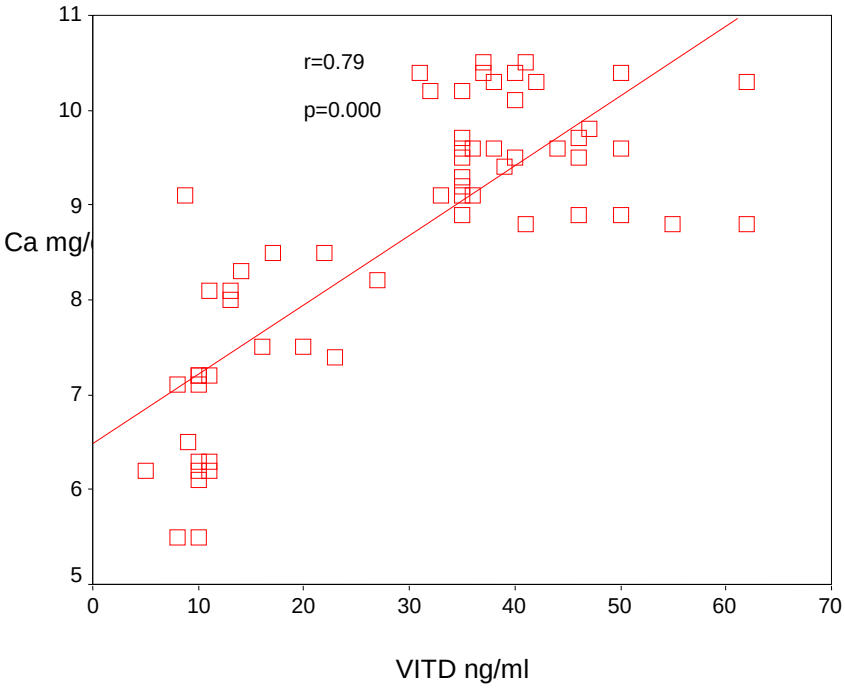


Figure (7): scatter plot correlating serum calcium with serum 25(OH) Vitamin D level.

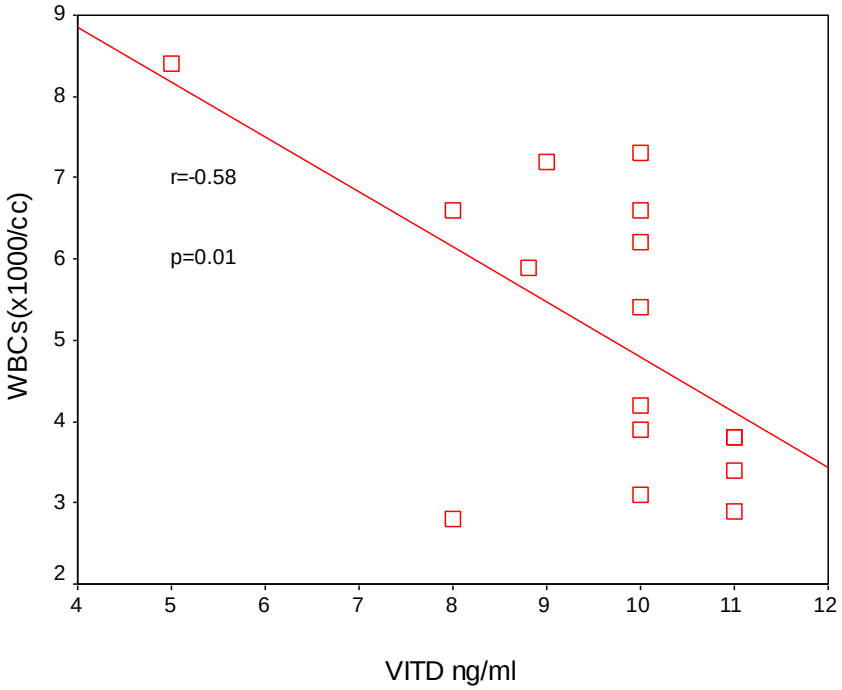


Figure (8): Scatter plot correlating 25 (OH)vitamin D and WBCs count.

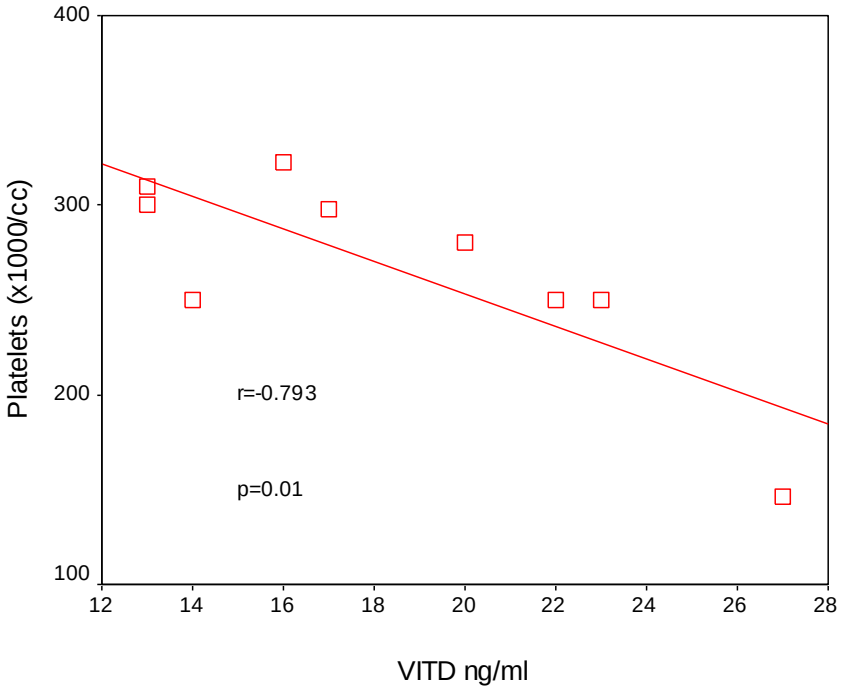


Figure (9): Scatter plot correlating 25 (OH)vitamin D and platelets count.

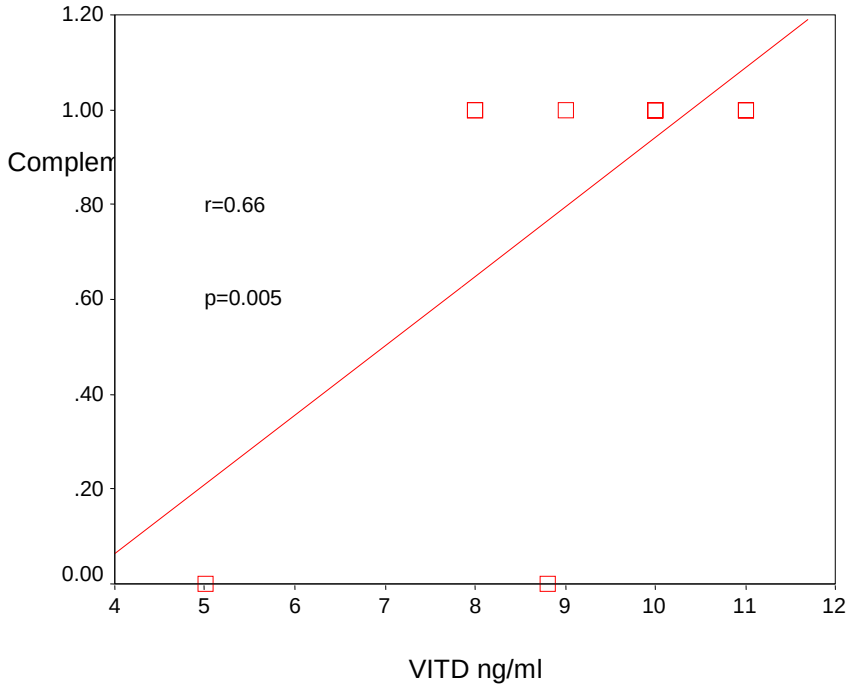


Figure (10): Scatter plot correlating serum 25 (OH)vitamin D and C 3.

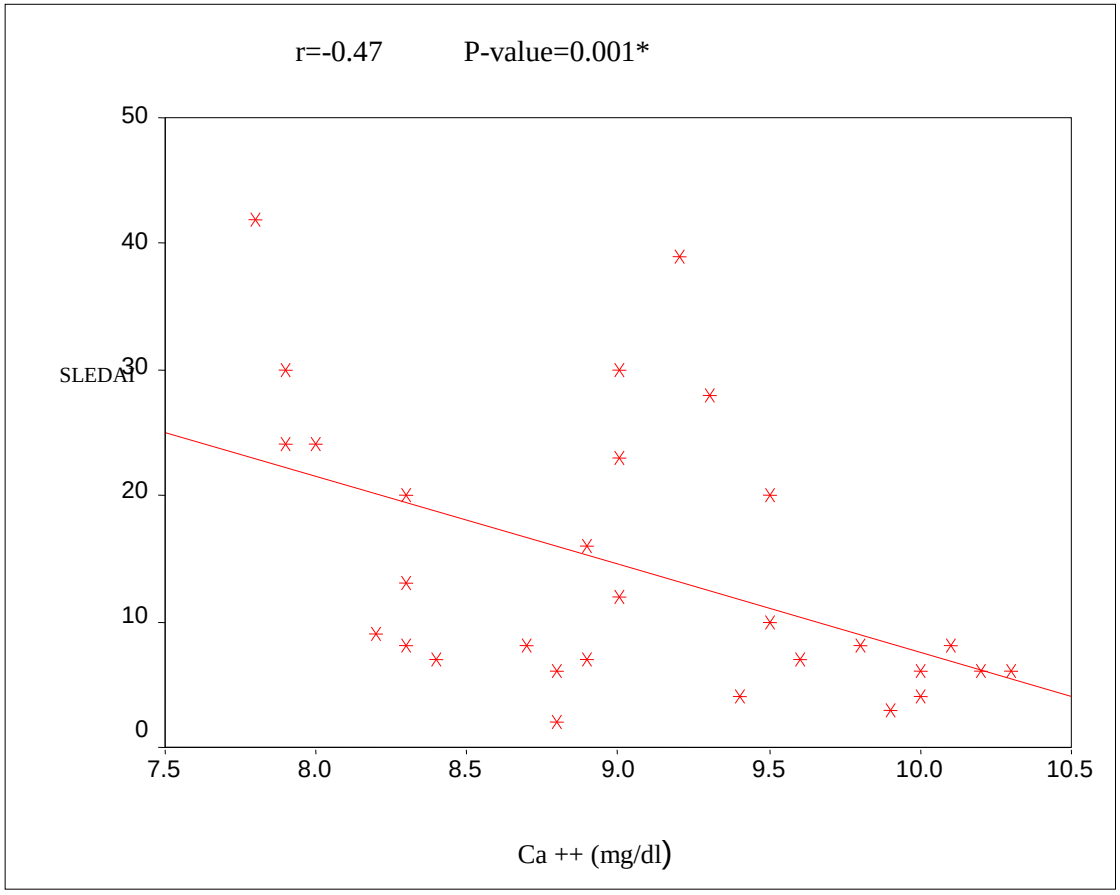
Table (16): Correlation coefficients of SLE disease parameters VS serum Ca levels.

SLE disease parameters	calcium	
	r	p
Disease duration (months)	0.25	>0.05
HB (gm %)	0.11	>0.05
RBCs (cells/cmm)	0.21	>0.05
WBCs(cell/cmm)	0.52	<0.05*
Platelets(cell/cmm)	0.73	<0.05*
ESR(mm/h)	-0.45	<0.05*
Serum C3(mg/dl)	0.63	<0.05*
Serum C 4(mg/dl)	0.35	<0.05*
24h protein in urine (mg/dl)	-0.40	<0.05*
Serum creatinine(mg/dl)	0.13	>0.05
SLEDAI score	-0.47	<0.001**
25(OH) vitamin D (ng/dl)	0.79	<0.001**

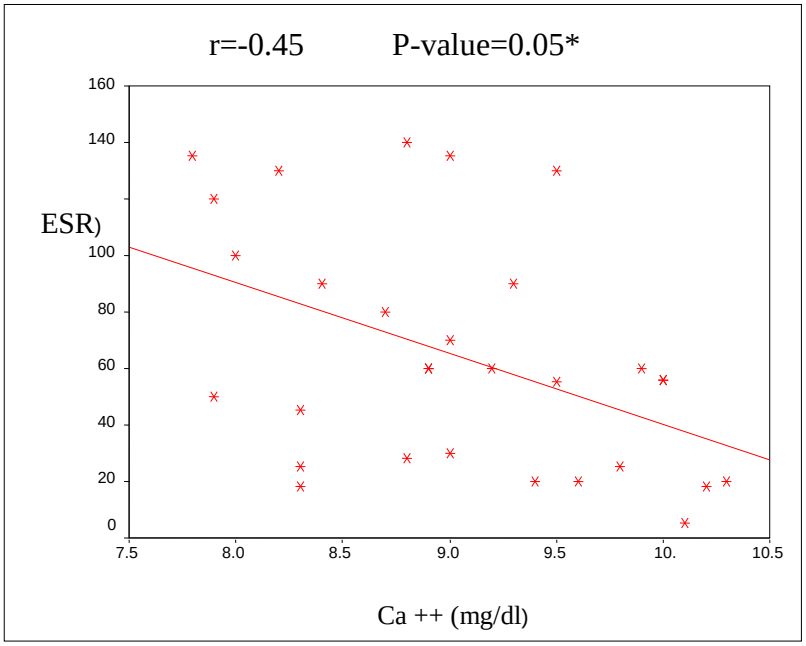
**P value (<0.001):Highly statistically significant.

* P value (<0.05): Significant.

P value (>0.05): Non significant



Figure(11) : correlation between Ca and SLEDAI Score.



Figure(12):correlation between Ca and ESR