Results

Results

- **Demographic data and disease variables in SLE patients (Table 1)**

  The mean value of age was 24.6 ± 4.4 years ; disease duration 8.8 ± 3.4 years ; BMI 28.4 ± 8.8 kg/m^2 ; and SLEDAI 16.2 ± 6.5. As regards corticosteroid therapy ; the mean value of the current dose was 10.4 mg/d ; the cumulative dose 24.8 g / and the total steroid duration 76.4 months .

- **As regards disease activity grading (DAG) in SLE patients (table 3 and figure 2)**

  10 Patients (25%) had grade I;
  16 Patients (40%) had grade II;
  7 Patients (17.5%) had grade III; and
  7 Patients (17.5%) had grade IV.

- **As regards of functional capacity in SLE patients**

  (table 4 and figure 3)

  8 Patients (20%) had grade I;
  13 Patients (32.5%) had grade II;
  14 Patients (35%) had grade III; and
  5 Patients (12.5%) had grade IV.

- **Tables (5 , 6 , 7) and figures (4 , 5 , 6)** show a high frequency of low BMD at the lumbar spine (L2-L4) and left hip (femoral neck , trochanter) as diagnosed by using DEXA in premenopausal female patients with SLE as compared to controls .

- **Tables (8 , 9 , 10 , 11 , 12 , 13) and figures (7 , 8 , 9 , 10 , 11 , 12)** show frequencies of osteopenia and osteoporosis at lumbar apine ($L_2 - L_4$) , femoral neck and trochanter . According to the World Health Organization Criteria **(WHO, 1994)**, 35% of our SLE patients had normal bone mineral density (BMD), 45% had

osteopenia and 20% had osteoporosis at the lumbar spine ; at the femoral neck 47.5% had normal BMD, 37.5% had osteopenia, and 15% suffered from osteoporosis ; at the trochanteric area 57.5% had normal BMD, 30% had osteopenia , and 12.5% had osteoporosis .

- **Tables (14 , 15 , 16) and figures (13 , 14 , 15)** show comparison between BMD (g/cm^2) at the lumbar spine, femoral neck, and trochantric area in SLE patients in relation to their grading of disease activity (GDA).When SLE patients were divided into groups according to their disease activity grading there were statistical significant differences between these groups as regard the BMD in all the studied areas .

- **Tables (17 , 18 , 19) and figures (16 , 17 , 18)** show comparison between BMD (g/cm^2) at lumbar spine , femoral neck, and trochantric area in SLE patients in relation to grading of functional capacity.By using one way ANOVA test, significant differences were found between BMD at the lumbar spine and proximal femur (femoral neck and trochanter) and grading of functional capacity in SLE patients.

- **Tables (20 , 21 , 22) and figures (19 , 20 , 21)** show comparison between BMD (g/cm^2) at lumbar spine , femoral neck, and trochantric area in SLE patients in relation to corticosteroid treatment .On the basis of their daily steroid dose, the patients were categorized as those receiving no steroid theraby, ≤ 7.5 mg/day or > 7.5 mg/day prednisolone equivalent dose and by using one-way ANOVA test, significant differences were found between these groups and BMD at the lumbar spine and the proximal femur (femoral neck and trochanter).

- **Tables (23 , 24 , 25)** show correlation coefficient between BMD (g/cm^2) at the studied areas, demographic data and disease variables . The BMD at both lumbar spine and proximal femur did not correlate with total corticosteroid duration. BMD at lumbar spine and trochanteric area correlated negatively with both cumulative and current corticosteroid dose but BMD at femoral neck correlated negatively only with current corticosteroid model dose.

- **Many of variables were significantly correlated with BMD in SLE patients so multiple regression analysis was done(table 26)** to determine the best model for predicting osteoporosis in SLE patients . Among the wide range of variables considered in the present study, current and cumulative corticosteroid doses , and BMI respectively were the most predicting osteoporosis at the lumbar spine ; at the femoral neck. Age , BMI , and SLEDAI respectively ; at the trochantric area, current and cumulative corticosteroid doses , and grading of functional capacity respectively were the most predicting osteoporosis .

- **Figures(22,23)** show DEXA at the lumbar spine from L2 to L4 and at the femoral bone receptively .the measured values are within normal range.

- **Figures(24,25)** show DEXA at the lumbar spine L2 to L4 and at the femoral bone respectively. The measured values show a low bone density which indicate osteopenia.

- **Figures(26,27)** show DEXA at the lumbar spine L2 to L4 and at the femoral bone respectively. The measured values indicates a very low bone density which indicate osteoporosis.

Table (1) : Demographic data and disease variables in SLE patients .

Variables	Mean (range)
Age (years)	24.6 (18 – 44)
Body mass index (BMI) [kg/m^2]	28.4 (18.2-44.2)
Disease duration (years)	8.8 (1/2 – 23)
SLEDAI	16.2 (2-54)
Corticosteroid therapy :	
* Current dose (mg/day)	10.4 (2.5-60)
* Cumulative dose (g)	24.8 (0.3-112.2)
* Total steroid duration (months)	76.4 (4 – 218)

Table (2): Corticosteroid treatment of SLE patients .

Corticosteroid treatment	Number of patients	%
Not treated	9	22.5%
≤ 7.5 mg/day	15	37.5%
> 7.5 mg/day	16	40%

Table (3): Grading of disease activity (GDA) in SLE patients

Grading of disease activity	Number of patients	%
I	10	25%
II	16	40%
III	7	17.5%
IV	7	17.5%

Table (4): Grading of functional capacity in SLE patients

Grading of functional capacity	Number of patients	%
I	8	20%
II	13	32.5%
III	14	35%
IV	5	12.5%

Table (5): Bone mineral density (BMD) (g / cm^2) at the lumbar spine ($L_2 - L_4$) in SLE patients and healthy controls .

	SLE (mean ± SD) (n=40)	Controls (mean ± SD) (n=20)	t	P
BMD (g/cm^2)	0.828 (± 0.12)	0.988 (± 1.7)	8.24	<0.001
T. score	-1.08 (± 0.5)	-0.37 (± 0.3)	5.67	<0.001
Z. score	-0.94 (± 0.24)	-0.24 (± 0.01)	13.23	<0.001

Table (6): Bone mineral density (BMD) (g / cm^2) at the femoral neck in SLE patients and healthy controls .

	SLE (mean ± SD) (n=40)	Controls (mean ± SD) (n=20)	t	P
BMD (g/cm^2)	0.832 (± 0.15)	0.940 (± 0.16)	2.5	<0.05
T. score	-1.19 (± 0.34)	-0.95 (± 0.25)	2.74	<0.01
Z. score	-1.01 (± 0.27)	-0.86 (± 0.1)	2.04	<0.05

Table (7): Bone mineral density (BMD) (g / cm^2) at the trochantric area in SLE patients and healthy controls .

	SLE (mean ± SD) (n=40)	Controls (mean ± SD) (n=20)	t	P
BMD (g/cm^2)	0.632 (± 0.18)	0.718 (± 0.19)	2.2	<0.05
T. score	-1.24 (± 0.51)	-0.77 (± 0.7)	2.19	<0.05
Z. score	-1.02 (± 0.1)	-0.82 (± 0.24)	2.10	<0.05

Table (8): Frequencies of osteopenia (T score < -1 SD) at lumbar spine (L_2-L_4) in SLE patients and healthy controls .

	SLE (mean ± SD) (n=40)	Controls(mean ± SD) (n=20)
Number	18	2
%	45%	10%
X^2	6.35	
P	<0.01	

Table (9): Frequencies of osteopenia (T score < -1 SD) at the femoral neck in SLE patients and healthy controls .

	SLE(mean ± SD) (n=40)	Controls(mean ± SD) (n=20)
Number	15	4
%	37.5%	20%
X^2	0.12	
P	>0.05	

Table (10): Frequencies of osteopenia (T score < -1 SD) at the trochantric area in SLE patients and healthy controls .

	SLE(mean ± SD) (n=40)	Controls(mean ± SD) (n=20)
Number	12	4
%	30%	20%
X^2	0.38	
P	>0.05	

Table (11): Frequencies of osteoporosis (T score < -2.5 SD) at the lumbar spine ($L_2 - L_4$) in SLE patients and healthy controls .

	SLE(mean ± SD) (n=40)	Controls(mean ± SD) (n=20)
Number	8	2
%	20%	10%
X^2	0.44	
P	>0.05	

Table (12): Frequencies of steoporosis (T score < -2.5 SD)at the femoral neck in SLE patients and healthy controls .

	SLE(mean ± SD) (n=40)	Controls(mean ± SD) (n=20)
Number	6	1
%	15%	5%
X^2	0.37	
P	>0.05	

Table (13): Frequencies of osteoporosis (T score < -2.5 SD) at the trochantric area in SLE patients and healthy controls .

	SLE(mean ± SD) (n=40)	Controls(mean ± SD) (n=20)
Number	5	1
%	12.5%	5%
X^2	0.62	
P	>0.05	

Table (14): Comparison between BMD (g/cm^2) at the lumbar spine ($L_2 - L_4$) in SLE patients in relation to their grading of disease activity (GDA) .

GDA	BMD (g/cm^2)		
	Range	Mean	± SD
I	0.812 to 1.22	0.905	± 0.30
II	0.804 to 1.05	0.869	± 0.14
III	0.720 to 0.890	0.800	± 0.12
IV	0.442 to 0.805	0.723	± 0.11
F	4.20		
P. value	<0.05		

Table (15): Comparison between BMD (g/cm^2) at the femoral neck in SLE patients in relation to their grading of disease activity (GDA).

GDA	BMD (g/cm^2)		
	Range	Mean	± SD
I	0842 to 1.12	0.921	± 0.29
II	0.802 to 1.42	0.864	± 0.11
III	0.448 to 0.882	0.772	± 0.12
IV	0.562 to 0.860	0.702	± 0.11
F	6.21		
P. value	<0.01		

Table (16): Comparison between BMD (g/cm^2) at the trochantric area in SLE patients in relation to their grading of disease activity (GDA) .

GDA	BMD (g/cm^2)		
	Range	Mean	± SD
I	0.788 to 0.998	0.812	± 0.13
II	0.786 to 0.992	0.684	± 0.12
III	0.408 to 0.702	0.592	± 0.09
IV	0.304 to 0.646	0.463	± 0.06
F	10.82		
P. value	<0.001		

Table (17): Comparison between BMD (g/cm^2) at the lumbar spine ($L_2 - L_4$) of SLE patients in relation to grading of functional capacity.

	BMD (g/cm^2)		
	Range	**Mean**	**± SD**
I	0.808 to 1.22	1.02	± 0.38
II	0.822 to 1.05	0.901	± 0.30
III	0.442 to 0.902	0.780	± 0.13
IV	0.684 to 0.888	0.712	± 0.11
F	4.74		
P. value	<0.05		

Table (18): Comparison between BMD (g/cm^2) at the femoral neck of SLE patients in relation to grading of functional capacity .

	BMD (g/cm^2)		
	Range	**Mean**	**± SD**
I	0.812 to 1.42	1.08	± 0.33
II	0.718 to 0.998	0.896	± 0.12
III	0.702 to 0.902	0.802	± 0.11
IV	0.448 to 0.898	0.752	± 0.10
F	6.18		
P. value	<0.01		

Table (19): Comparison between BMD (g/cm^2) at the trochantric area of SLE patients in relation to grading of functional capacity .

Grading of functional capacity	BMD (g/cm^2)		
	Range	Mean	± SD
I	0.870 to 0.994	0.926	± 0.14
II	0.514 to 0.998	0.688	± 0.12
III	0.334 to 0.668	0.572	± 0.08
IV	0.304 to 0.398	0.336	± 0.04
F	15.82		
P. value	<0.001		

Table (20): Comparison between BMD (g/cm^2) at lumbar spine ($L_2 - L_4$) in SLE patients in relation to corticosteroid treatment .

Corticosteroid treatment	BMD (g/cm^2) (Mean ± SD)	Significance
Not teated	0.912 ± 0.32	F = 6.28 P <0.01
≤ 7.5 mg/day	0.864 ± 0.12	
> 7.5 mg/day	0.734 ± 0.09	

Table (21): Comparison between BMD (g/cm^2) at the femoral neck in SLE patients in relation to corticosteroid treatment .

Corticosteroid treatment	BMD (g/cm^2) (Mean ± SD)	Significance
Not treated	0.902 ± 0.28	F = 4.16 P <0.05
≤ 7.5 mg/day	0.872 ± 0.12	
> 7.5 mg/day	0.760 ± 0.10	

Table (22): Comparison between BMD (g/cm^2) at the trochantric area in SLE patients in relation to corticosteroid treatment .

Corticosteroid treatment	BMD (g/cm^2) (Mean ± SD)	Significance
Not treated	0.801 ± 0.13	F = 11.8 P <0.001
≤ 7.5 mg/day	0.696 ± 0.08	
> 7.5 mg/day	0.524 ± 0.04	

Table (23): Correlation coefficient between bone mineral density at lumbar spine, demographic data and disease variables.

variable	BMD at L2-L4	
	r	P-value
Age	-0.43	<0.05
Disease duration	-0.14	>0.05
BMI	0.45	<0.05
Current Corticosteriod	-0.64	<0.01
Cumulative Corticosteriod	-0.63	<0.01
Total Corticosteriod duration	-0.13	>0.05
SLEDAI	-0.44	<0.05
Functional capacity	-0.45	<0.05

Table (24): Correlation coefficient between bone mineral density at femoral neck, demographic data and disease variables.

Variables	BMD at femoral neck	
	r	P-value
Age	-0.60	<0.01
Disease duration	-0.12	>0.05
BMI	0.48	<0.01
Current Corticosteriod	-0.45	<0.05
Cumulative Corticosteriod	-0.20	>0.05
Total Corticosteriod duration	-0.12	>0.05
SLEDAI	-0.47	<0.01
Functional capacity	-0.46	<0.01

Table (25): Correlation coefficient between bone mineral density at trochantric area, demographic data and disease variables.

Variables	BMD at trochantric area	
	r	P-value
Age	-0.40	<0.05
Disease duration	-0.10	>0.05
BMI	0.44	<0.05
Current Corticosteriod	-0.83	<0.001
Cumulative Corticosteriod	-0.81	<0.001
Total Corticosteriod duration	-0.16	>0.05
SLEDAI	-0.80	<0.001
Functional capacity	-0.81	<0.001

Table (26): The best model for predicting osteoporosis at lumbar spine, femoral neck, and trochantric area in SLE patients.

Site	Best model	Regression	t	P-value
Lumbar spine (L2-L4)	Current corticosteriod dose	0.980	2.74	<0.01
	Cumulative corticosteriod dose	0.979	2.70	<0.01
	BMI	0.963	2.18	<0.05
Femoral neck	Age	0.973	2.66	<0.01
	BMI	0.966	2.24	<0.01
	SLEDAI	0.964	2.22	<0.01
Trochantric area	Current corticosteriod dose	0.997	5.43	<0.001
	Cumulative corticosteriod dose	0.994	3.12	<0.001
	Functional capacity	0.993	3.11	<0.001

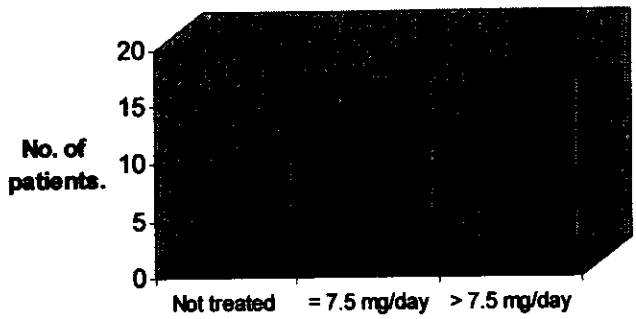


Fig. (1): Corticosteroid treatment of SLE patients.

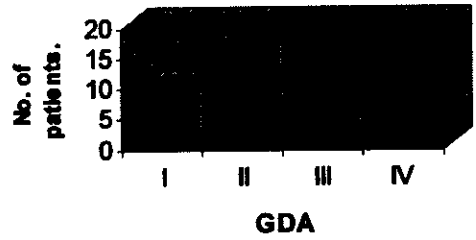
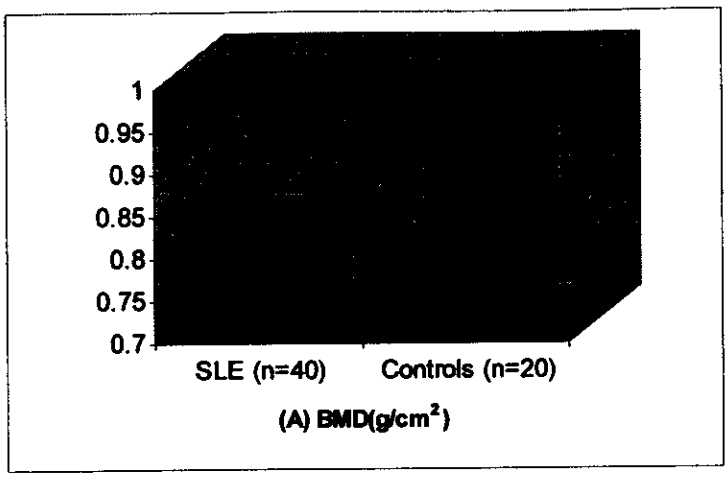
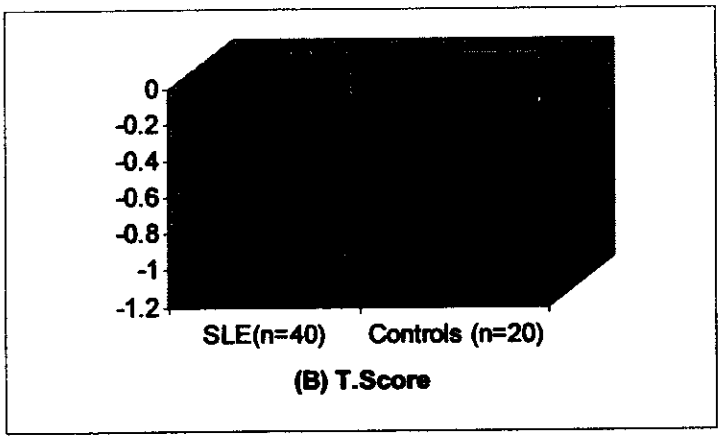


Fig. (2): Grading of disease activity (GDA) in SLE patients.

Fig. (3): Grading of functional capacity in SLE patients.





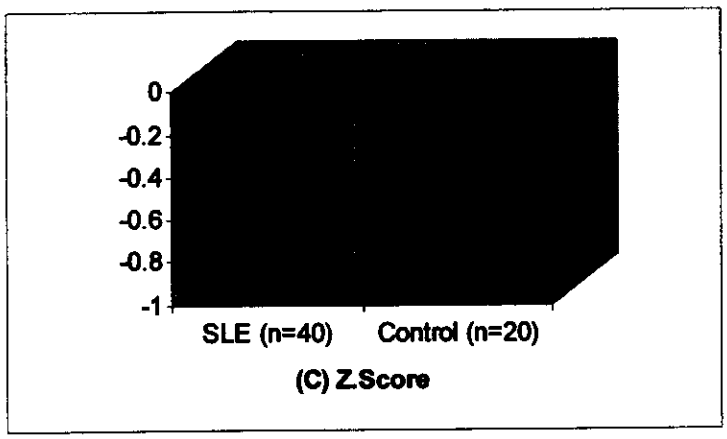
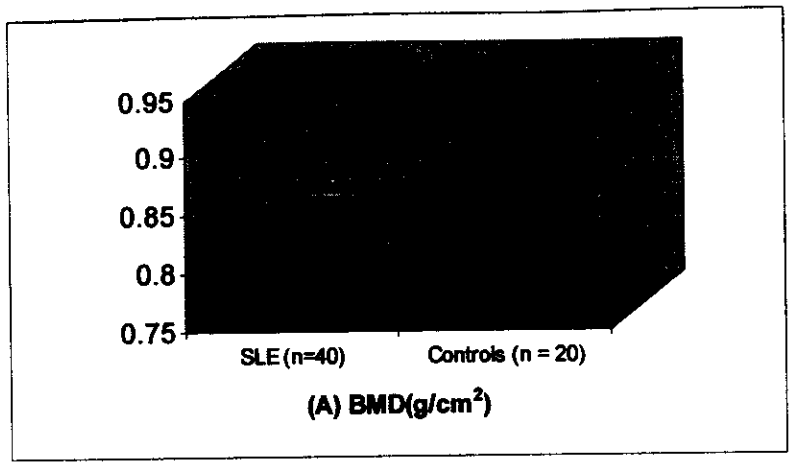
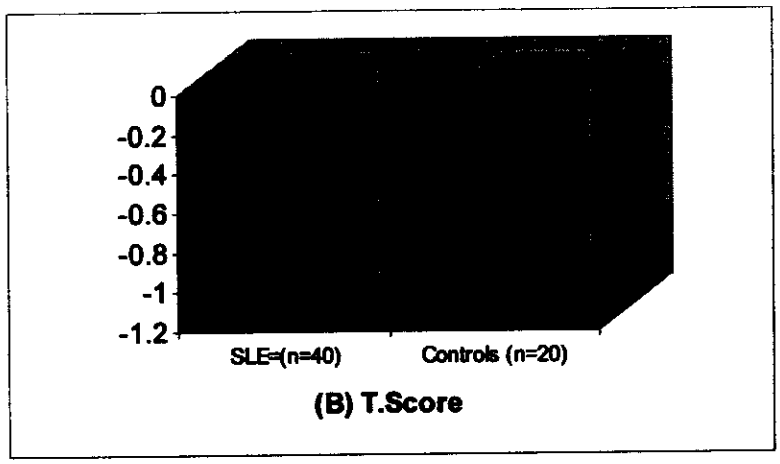


Fig (4) : Bone mineral density (BMD) (g/cm^2) at the lumbar spine (L_2-L_4) in SLE patients and healthy controls.





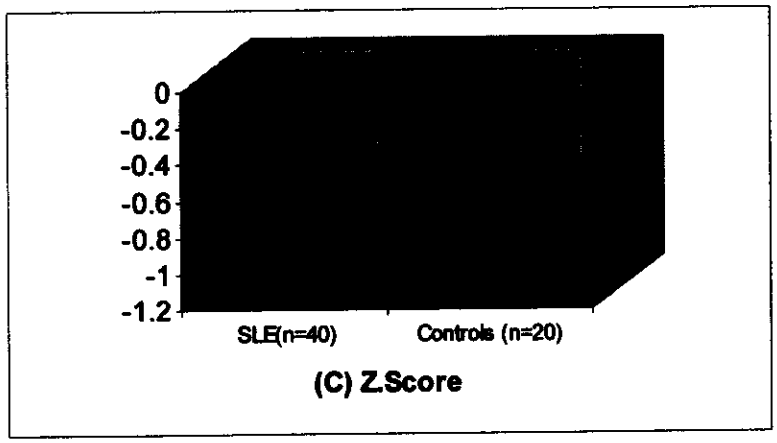
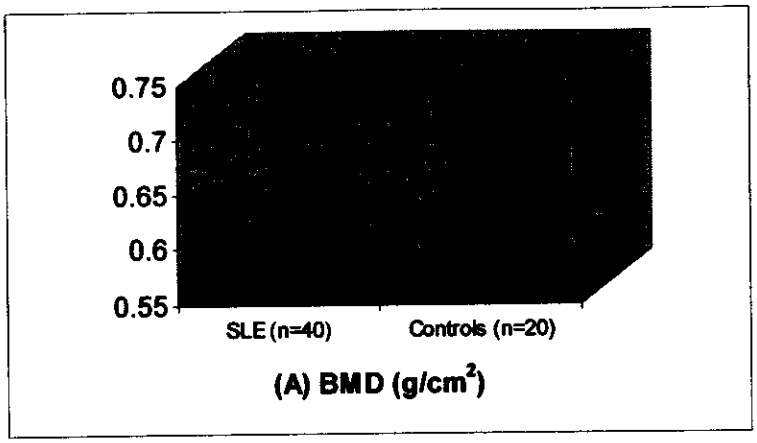
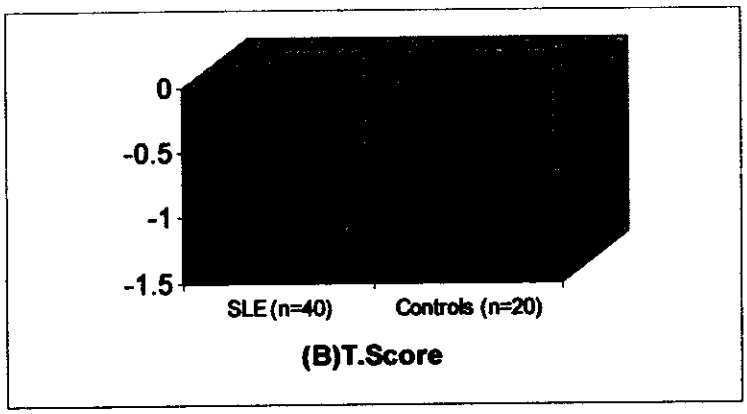


Fig (5) : Bone mineral density (BMD) (g/cm^2) at the femoral neck in SLE patients and healthy controls.





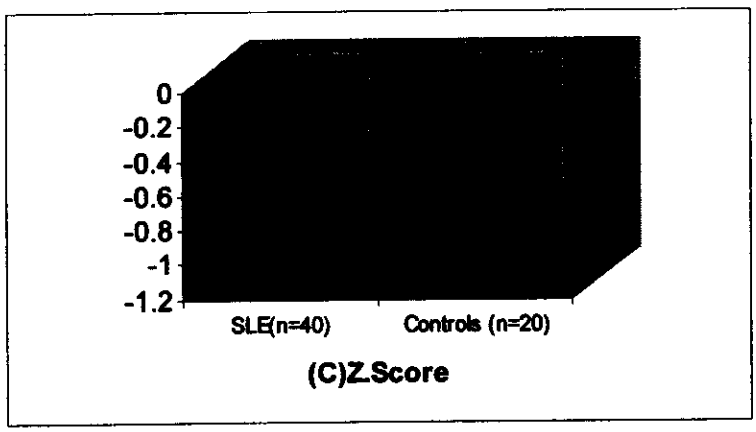


Fig (6) : Bone mineral density (BMD) (g/cm^2) at the trochantric area in SLE patients and healthy controls.

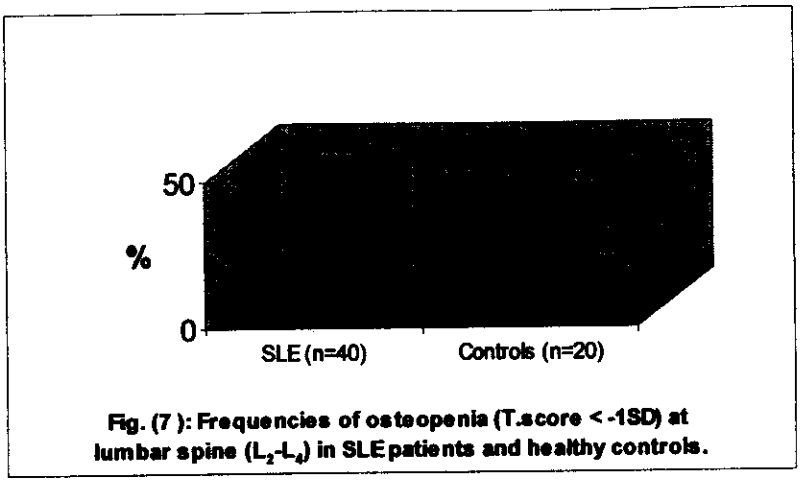


Fig. (7): Frequencies of osteopenia (T.score < -1SD) at lumbar spine (L_2-L_4) in SLE patients and healthy controls.

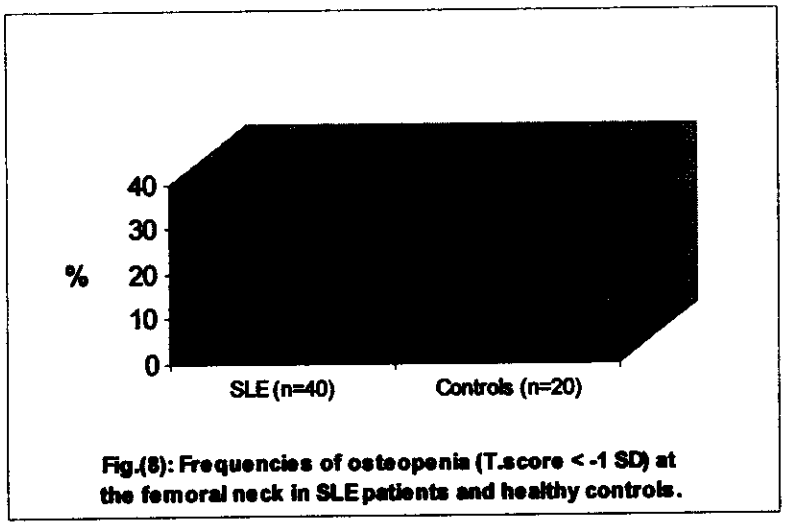


Fig.(8): Frequencies of osteopenia (T.score < -1 SD) at the femoral neck in SLE patients and healthy controls.

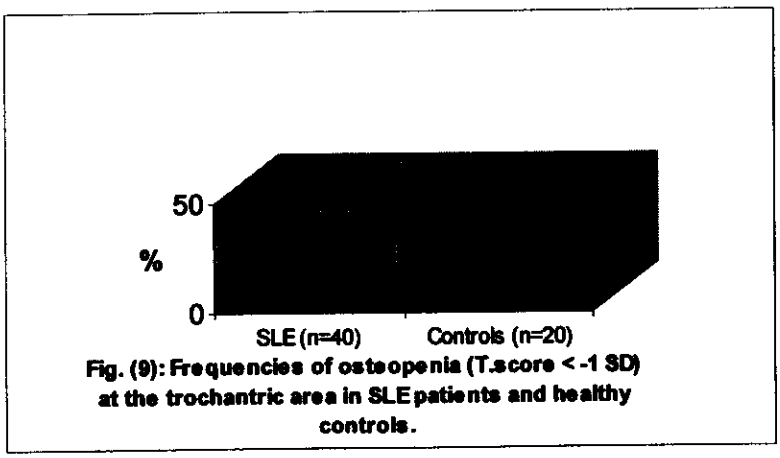


Fig. (9): Frequencies of osteopenia (T.score < -1 SD) at the trochantric area in SLE patients and healthy controls.

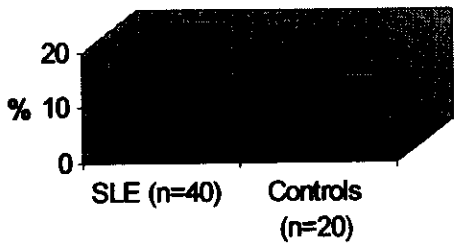


Fig.(10): Frequencies of osteoporosis (T.score < -2.5 SD) at the lumbar spine (L_2-L_4) in SLE patients and healthy controls.

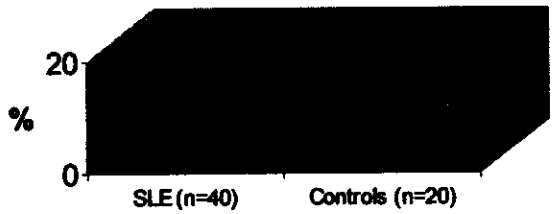


Fig.(11): Frequenices of osteoporosis (T.score < -2.5 SD) at the femoral neck in SLE patients and healthy controls.

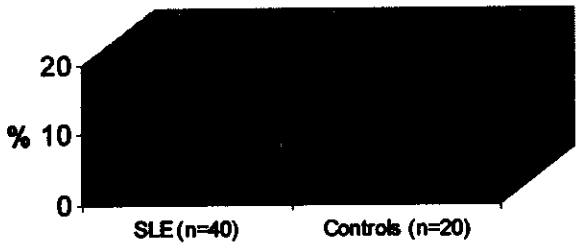


Fig.(12): Frequencies of osteoporosis (T.score < -2.5 SD) at the trochantric area inSLE patients and healthy controls.

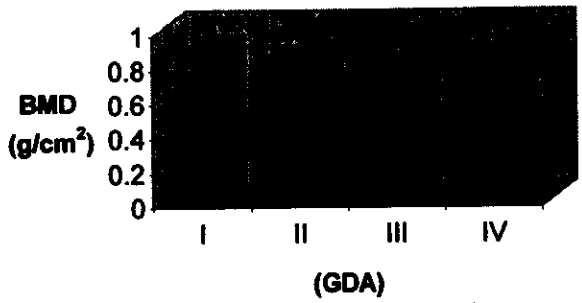


Fig. (13): Comparison between BMD (g/cm^2) at the lumbar spine (L_2-L_4) in SLE patients in relation to their grading of disease activity (GDA).

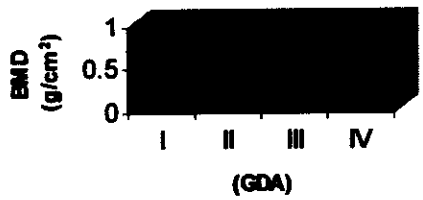


Fig. (14): Comparison between BMD (g/cm^2) at the femoral neck in SLE patients in relation to their grading of disease activity.

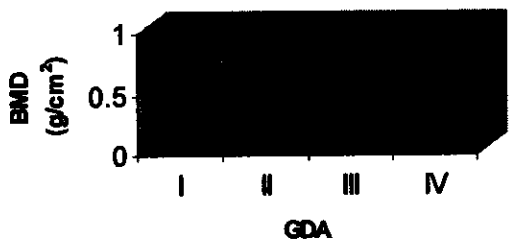
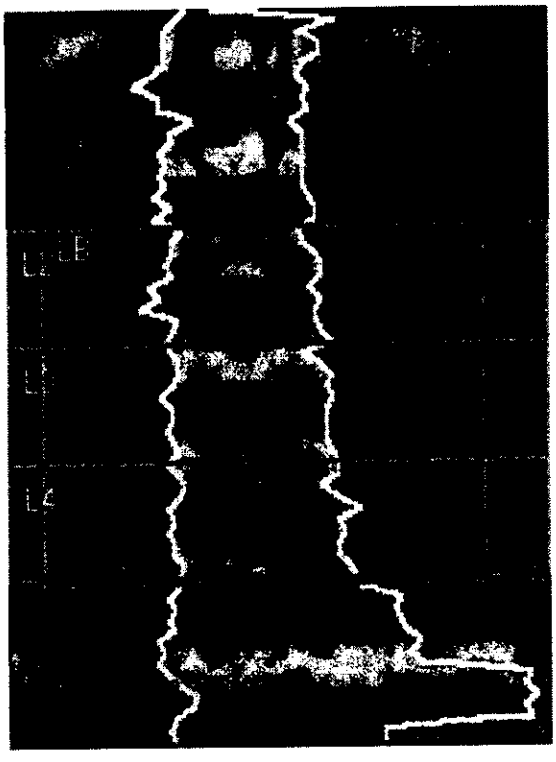


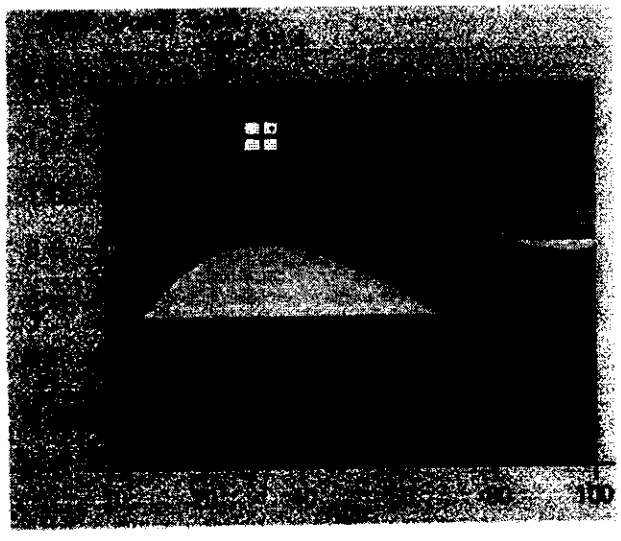
Fig. (15): Comparison between BMD (g/cm^2) at the trochantric area in SLE patients in relation to their grading of disease activity.

Fig. (16): Comparison between BMD (g/cm^2) at the lumbar spine (L_2-L_4) of SLE patients in relation to grading of functional capacity.

Fig. (17): Comparison between BMD (g/cm^2) at the femoral neck of SLE patients in relation to grading of functional capacity.

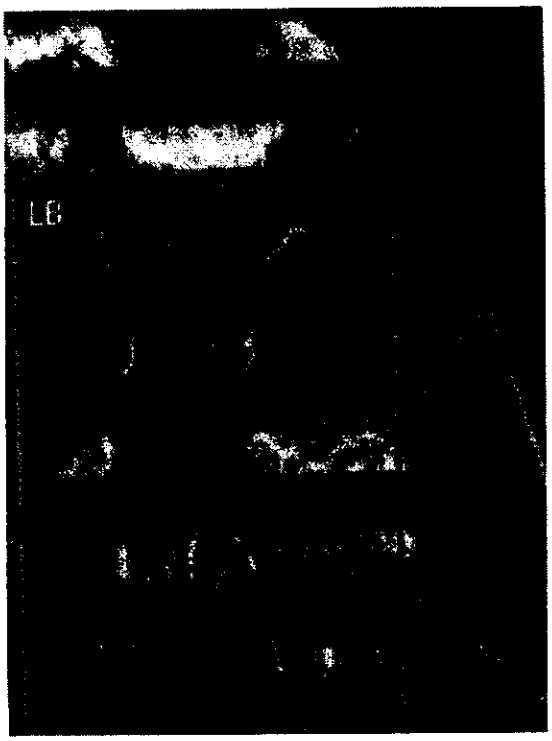
Fig.(18): Comparison between BMD (g/cm^2) at the trochantric area of SLE patients in relation to grading of functional capacity.





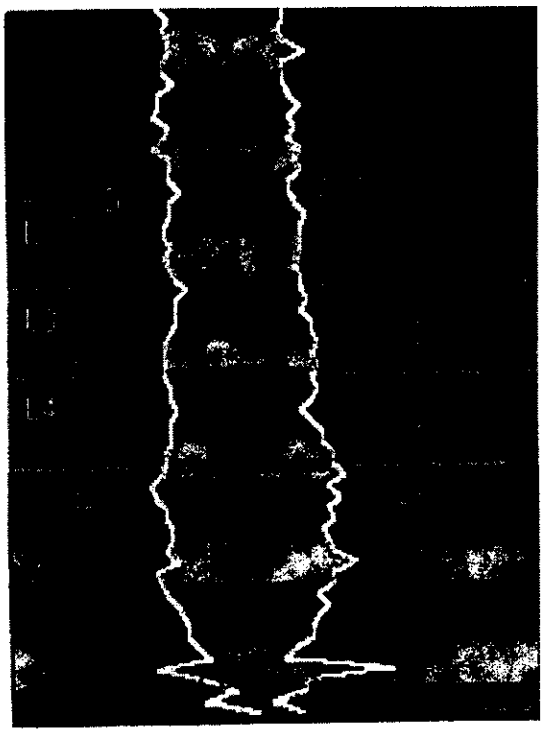
Region	BMD (g/cm^2)	T-Score
$L_2 - L_4$	1.210	+ 1.20

Fig (22) : DEXA of the lumbar spine from L_2 to L_4 . The measured values are within normal range .



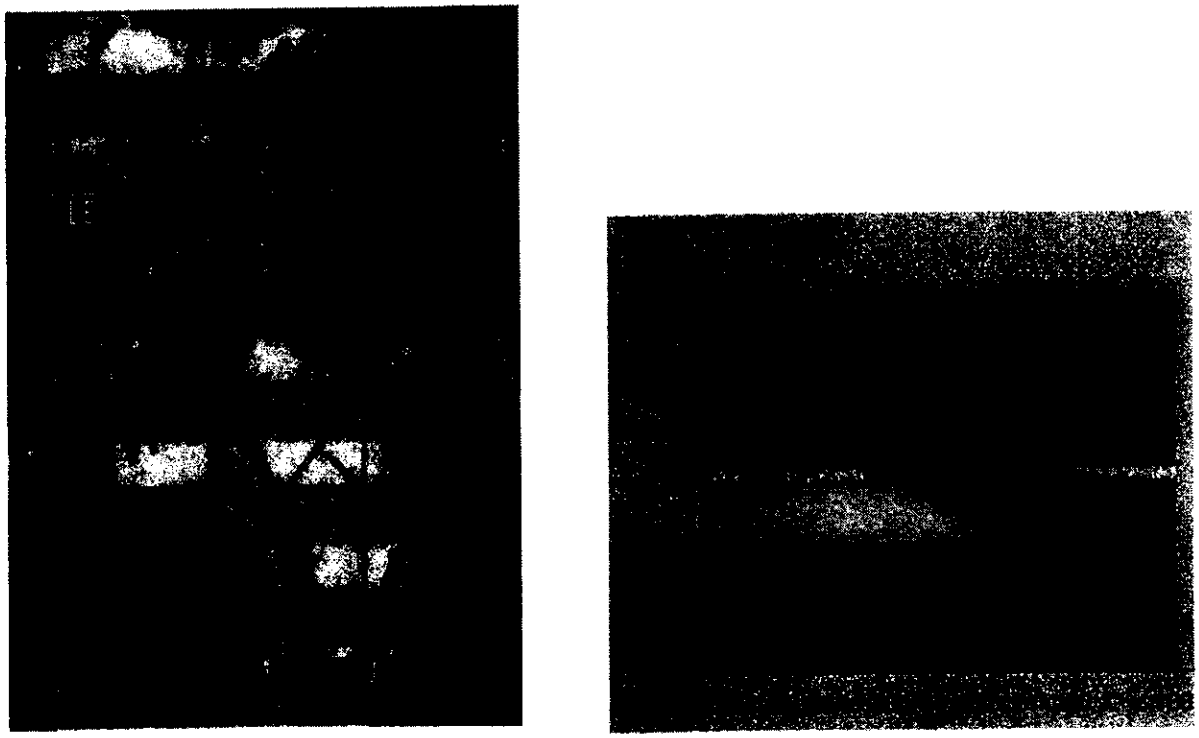
Region	BMD (g/cm^2)	T-Score
▪ Femoral neck	0.966	+ 0.98
▪ Trochanter	0.802	+ 0.75

Fig (23) : DEXA at the fermoral bone . The measured values are within normal range .



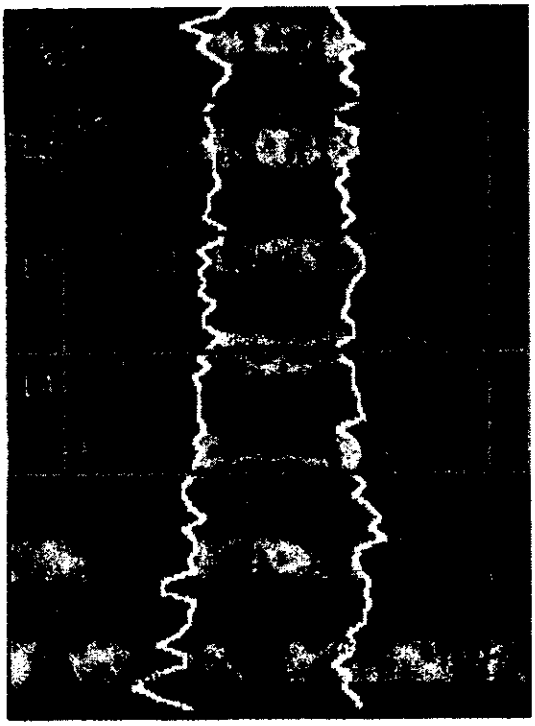
Region	BMD (g/cm^2)	T-Score
$L_2 - L_4$	0.800	- 1.81

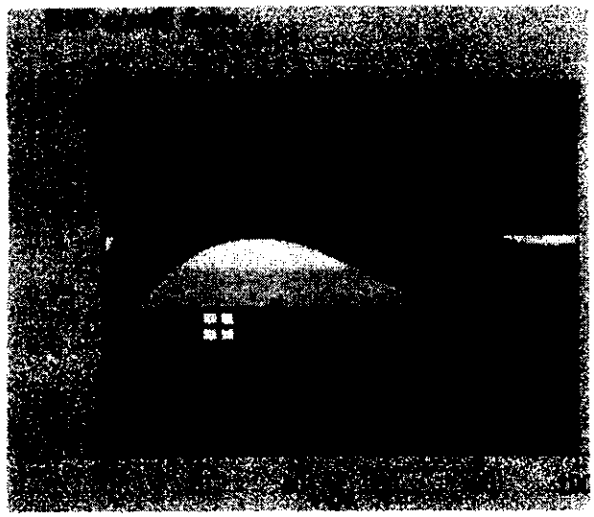
Fig (24) : DEXA at the lumbar spine from L_2 to L_4 . The measured values show a low bone density indicate osteopenia .



Region	BMD (g/cm^2)	T-Score
▪ Femoral neck	0.723	- 1.20
▪ Trochanter	0.592	- 1.45

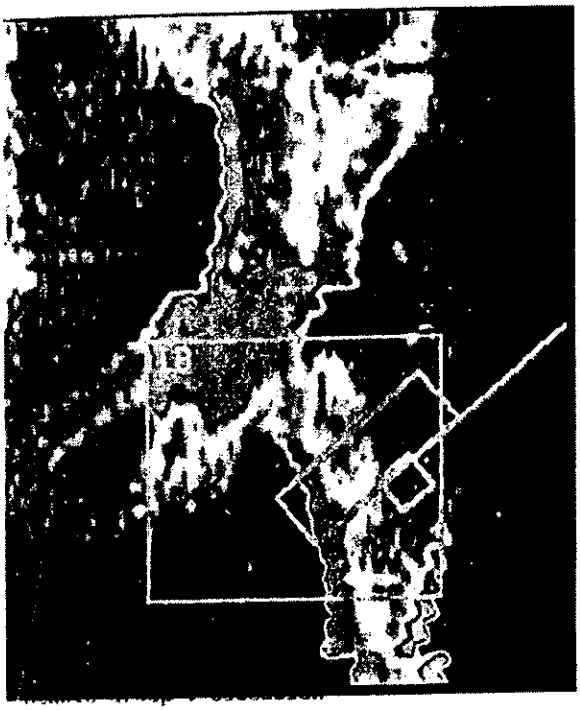
Fig (25) : DEXA at the fermoral bone . The measured values show a low bone density indicate osteopenia .

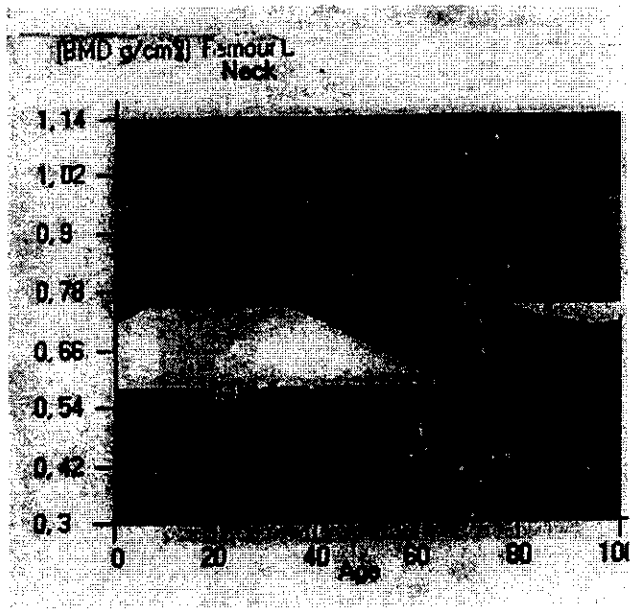




Region	BMD (g/cm^2)	T-Score
$L_2 - L_4$	0.662	- 2.83

Fig (26) : DEXA at the lumbar spine from L2 to L4 . The measured values show a very low bone density indicate osteoporosis .





Region	BMD (g/cm^2)	T-Score
▪ Femoral neck	0.579	- 2.49
▪ Trochanter	0.189	- 5.70

Fig (27) : DEXA at the fermoral bone . The measured values show a very low bone density indicate osteoporosis .