AIM OF THE WORK

The aim of this work is to study the relation between CD4 count and development of some opportunistic infections in late stages of HIV, in which CD4 less than 500 cells/mm^3, among HIV Egyptian patients stressing on pulmonary TB, toxoplasmosis, candidiasis, infectious diarrhea and Kaposi sarcoma.

PATIENTS AND METHODS

Research Strategy:

Prospective study.

Research Setting:

The study will be conducted in Alexandria Fever hospital in cooperation with Tropical Medicine department and Parasitology department Alexandria University.

Target population:

The study will be conducted on 50 HIV patients treated in Alexandria Fever hospital with no age or sex predilection

Data collection tool:

Data will be collected by the investigator herself using transfer sheet from HIV patients attending Alexandria Fever hospital for treatment.

Plan for data collection

The study will applied on confirmed 50 HIV patients according to The surveillance case definition for HIV that was adopted by the Council of State and Territorial Epidemiologists (CSTE), CDC and WHO in 2008.[48][187]

Confirmed HIV:

A case of HIV infection as "an individual with HIV infection irrespective of clinical stage…confirmed by laboratory criteria according to country definitions and requirements".

Clinical Criteria:

The presence of signs or symptoms consistent with HIV infection or Acquired Immune Deficiency Syndrome (AIDS) is no longer considered sufficient for the HIV case definition; suspected cases must a have laboratory confirmed positive HIV test (antibody or virologic).

Laboratory Criteria:

(1) Adults and children 18 months or older: Antibody detection 2 times ELIZA then confirmed by WB

(2) Children younger than 18 months: virological PCR for RNA. [151]

Study patients were interviewed on sociodemographic factors and a detailed clinical evaluation (history and examination) and relevant laboratory investigation for all patients

were done. Some of these investigations are mandatory for all patients and others are optional according to the clinical presentation of the patients.

Mandatory investigations:

1. CBC.
2. SGOT, SGPT.
3. Urea, creatnine.
4. CD4 count by flow cytometery should be < 500 cells/mm^3.
5. X-ray chest.
6. Ultrasound abdomen.

Optional investigations:

1- Zeihl- Neelsen staining of sputum for TB.

2- Blood culture.

3- Toxoplasma IgG, IgM.

4- Throat swab for Candida.

5- Stool examination: using
   a. Direct wet mont.
   b. Formalin-ether sedimentation concentration.
   c. Spcial staining:
      - Modified Ziehl-Neelsen stain.
      - Modified trichrome techniques
      - Safernin stain.

6- Stool culture.

7- CT scan brain.

For all patients we took a sample of peripheral blood and did complete blood picture, serum urea, serum creatnine, ALT, AST and CD4 count .we did CD4 count by flow cytometry, CD4 should be less than 500 cells/mm^3. [188] then we will do correlation between CD4 level and the studied OIs.

For diagnosis of Oropharyngeal candidiasis was made on the clinical appearance of white curdlike plaques (pseudomembranous) or red atrophic areas (erythematous) in the oral cavity.[189] For confirmation Oropharyngeal swab obtained and spread a smear on glass slide then allow to air dry then stain with a Gram stain and was examined for the presence of yeast, hyphae, or pseudohyphae that were consistent with Candida species.[61]

For diagnosis of pulmonary TB, for clinically suspected cases whom had symptoms such as fever, cough for more than 2 weeks all these patients were subjected to Direct microscopy of acid fast bacilli (AFB) stained sputum for 3 successive days of mourning sputum and chest X- ray were done for all the patients.[75][190]

For diagnosis of toxoplasmic encephalitis presence of neurological sign and symptoms on admission, demonstration of multiple ring-enhancing cerebral parenchymal

lesions on contrast-enhanced CT or MRI scans in the presence of anti-toxoplasma antibody IGg in serum and clinical response to anti-toxoplasma therapy. [191] we did also IgM to differentiate between recent or reactivation of old infection of *Toxoplasma*.[92]

For diagnosis of diarrhea a single stool sample was collected from each participant and examined for intestinal parasites. Stool specimen were processed using direct technique (saline and iodine mounts) to identify trophozoite and cyst of protozoan parasites and using formol-ether concentration technique. Modified acid fast stain was used to detect oocysts of *Cryptosporidium* species and *Isospora belli*. [192] Modified trichrome staining for detection of spores *Microsporidia spp* and oocyst of *Cyclospora* .[193] Safranin stain for *Cyclospora*.

For diagnosis of bacterial diarrhoea we did stool culture and blood for diagnosis of bacterial causes of diarrhoea e.g. salmonella. [98]

Kaposi sarcoma was diagnosed based on clinical appearance may be nodular, papular or blotchy; they may be red, purple, brown or black mainly found in mucous membrane and skin.[194]

Ultrasound of abdomen did for all patients to assess if there are lymphadenopathy, hepatomegaly, and splenomegaly as a result of HIV [195] or abdominal involvement from other opportunistic infection. [196]

Statistical analysis of the data

Data were fed to the computer and analyzed using IBM ***SPSS software package version 20.0.*** Qualitative data were described using number and percent. Quantitative data were described using Range (minimum and maximum), mean, standard deviation and median. Comparison between different groups regarding categorical variables was tested using Chi-square test. When more than 20% of the cells have expected count less than 5, correction for chi-square was conducted using Fisher's Exact test or Monte Carlo correction. The distributions of quantitative variables were tested for normality using ***Kolmogorov-Smirnov test, Shapiro-Wilk test and D'Agstino test, also Histogram and QQ plot were used for vision test.*** If it reveals normal data distribution, parametric tests was applied. If the data were abnormally distributed, non-parametric tests were used. For abnormally distributed data, comparison between two independent populations were done using Mann Whitney test Significance of the obtained results was judged at the 5% level.

RESULTS

Section I: Demographic characteristics of the studied patients

Section II: Clinical data of the studied patients

Section III: laboratory data of studied patients

Section IV: Imaging data

Section V: Distribution of the studied patients according to prevalence of opportunistic infections

Section VI: CD4 classifications

Section VII: Relations to CD4

I) Demographic characteristics

Table VIII: The distribution of HIV cases among the studied patients by some demographic data n=(50)

	No.	%
Age		
<30	9	18.0
30 – 40	24	48.0
40 – 50	10	20.0
>50	7	14.0
Min. – Max.	18.0 – 65.0	
Mean ± SD.	37.76 ± 10.62	
Median	35.0	
Sex		
Male	41	82.0
Female	9	18.0

This table shows that more than 50% of cases were males (82%) the ratio between male:female was about 4:1 . Age of HIV cases ranged from18-65 years with mean age of (37.76 ± 10.62). The least number of cases aged more than 50 years while more than half of them aged 30-50years (68%).

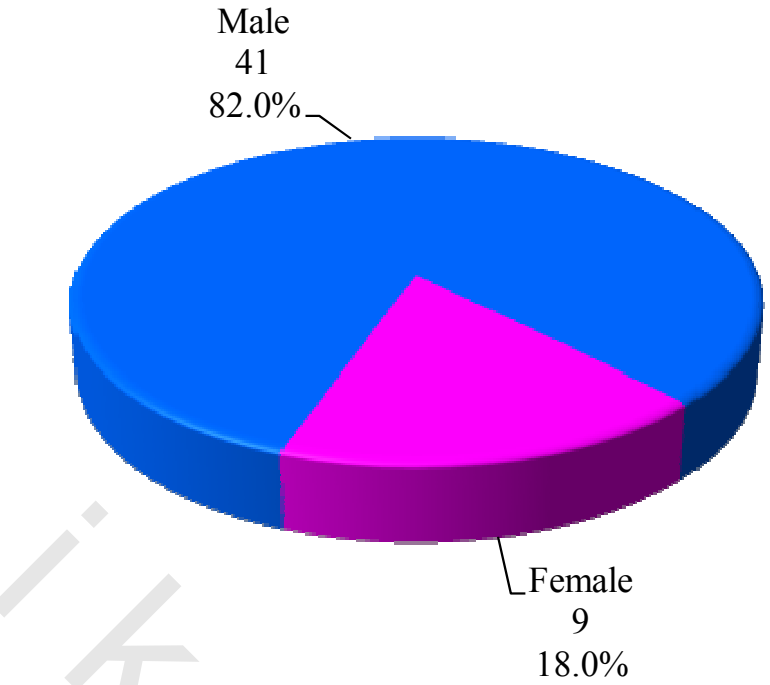

Figure (7): Sex distribution of HIV cases of the studied patients.

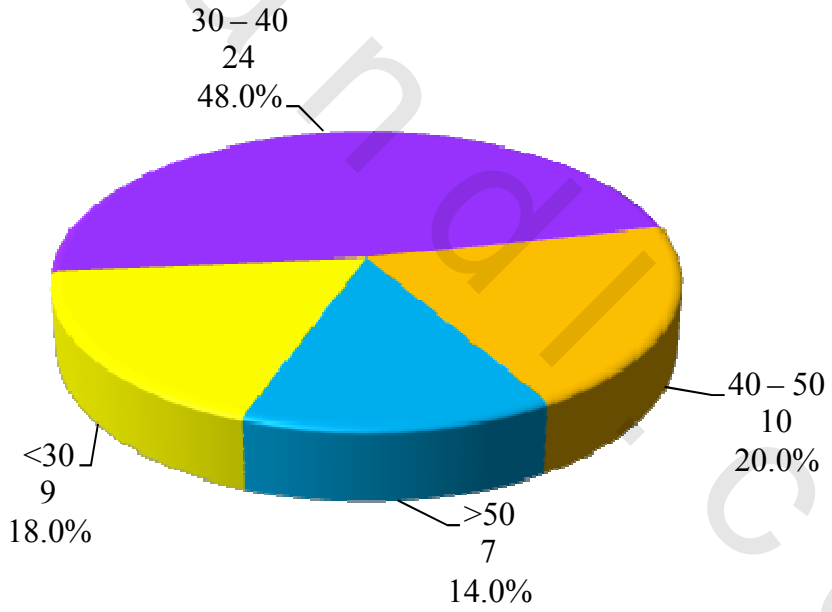

Figure (8): Age distribution of HIV cases of the studied patients.

II) Clinical Data

Table IX: Distribution of HIV patients according to clinical presentations:

	No.	%
Prolonged Fever	46	92.0
Cough	38	76.0
Weight loss	32	64.0
White tongue	32	64.0
Chronic Diarrhea	17	34.0
Disturbed level of consciousness (DLC)	2	4.0
Rash on skin	2	4.0
Lesions on tongue	1	2.0

This table shows that fever was detected in most cases in the study in about 92% followed by cough in about 76%. Weight loss and oral thrush has the same frequency present in about 64%. DLC and skin rash has the same incidence 4%. Only one case has lesions on tongue.

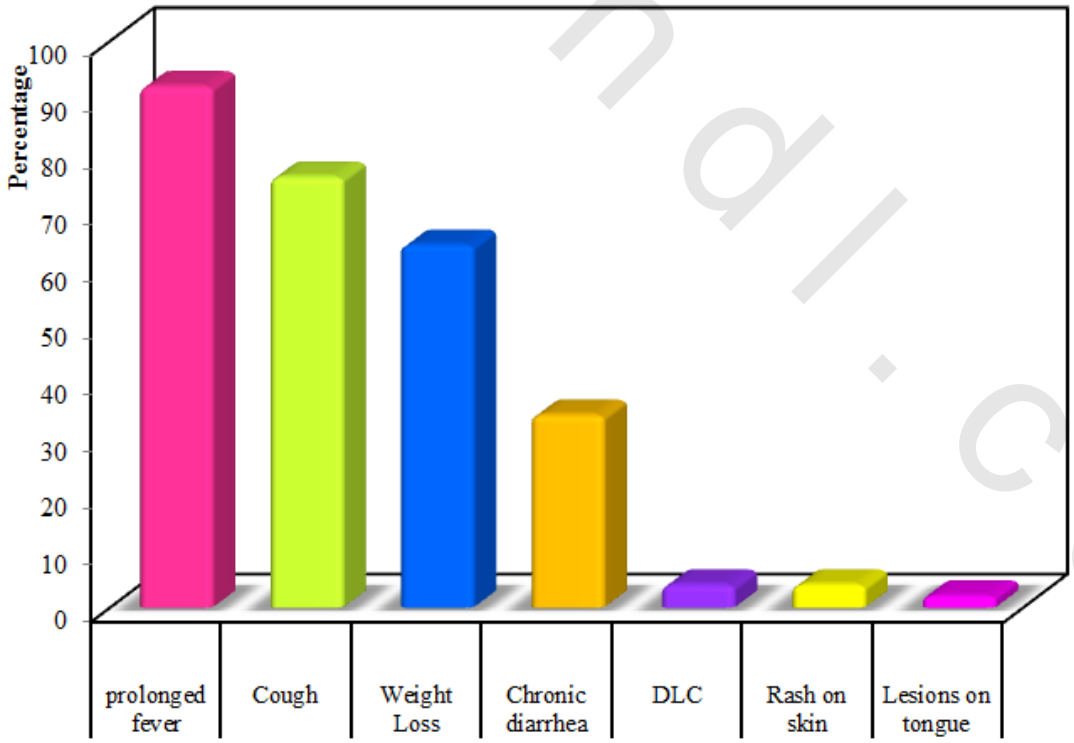

Figure (9): Distribution of studied patients according to clinical presentations.

III) Laboratory data

Table X: Distribution of studied patients according to lab investigations (n=50)

	Min. – Max.	Mean ± SD.	Median
WBCs $\times 10^3$	1.11 – 21.26	6.58 ± 4.33	6.09
Neutrophils $\times 10^3$	0.33 – 19.23	5.16 ± 4.06	4.19
Lymphocytes $\times 10^3$	0.02 – 2.29	0.93 ± 0.65	0.71
Monocytes $\times 10^3$	0.0 – 1.86	0.36 ± 0.32	0.34
Eosinophil $\times 10^3$	0.0 – 0.62	0.14 ± 0.16	0.07
Basophils $\times 10^3$	0.0 – 0.33	0.02 ± 0.05	0.01
RBCs $\times 10^6$	1.23 – 5.53	3.66 ± 0.93	3.51
HG g/dl	5.10 – 15.0	9.90 ± 2.53	9.75
Hematocrit %	14.80 – 226.90	33.20 ± 28.91	28.70
Platelets $\times 10^3$	86.0 – 789.0	254.82 ± 134.57	226.0
Urea mg/dl	20.0 – 195.0	34.48 ± 25.95	28.0
S.Creatnine mg/dl	0.30 – 3.70	0.87 ± 0.54	0.71
ALT u/L	12.0 – 264.0	43.72 ± 47.09	31.0
AST u/L	16.0 – 345.0	44.44 ± 51.03	29.50

This table shows the result of CBC, liver enzymes and kidney function tests as regard median and mean±SD.

Table XI: Hematological parameters of the studied patients.

Laboratory findings						
	Normal values	Cases n=50		Abnormal values	Cases n=50	
		No.	%		No.	%
CBC	HB (g/dl)	12	24	Anemia	38	76
	RBCS × 10^6	31	62	Microcytosis Macrocytosis	19 0	38 0
	Platelets x 10^3	41	82	Thrombocytosis Thrombocytopenia	4 5	8 10
	WBC × 10^3	22	44	Leukocytosis Leucopenia	8 20	16 40
	Neutrophils × 10^3	19	38	Neutrophilia Neutropenia	21 10	42 20
	Lymphocytes × 10^3	17	34	lymphopenia	33	66
	Eosinophils × 10^3	48	96	Esinophilia	2	4
	Basophils × 10^3	50	100	Basophilia	0	0
	Monocytes × 10^3	48	9	Monocytosis	2	4

This table shows results of complete blood count (CBC) of studied cases, Anemia was detected in 76%. Red blood cell shows microcytosis in 76% of cases**.** Half of cases have microcytic microchromic anemia and half normochromic normocytic.

The abnormal platelets count was detected in 18% of the cases (5 cases had thrombocytopenia and 4 cases had thrombocytosis). Out of all of the studied cases 56% had abnormal white blood cell count (40% of cases had leucopenia while leukcocytosis was detected in 16 % of cases). The differential white blood cell count shows the following abnormalities: Lymphopenia in 66%, neutrophilia in 42%, neutropenia 20%, Basophilia in 0% and monocytosis in 4%

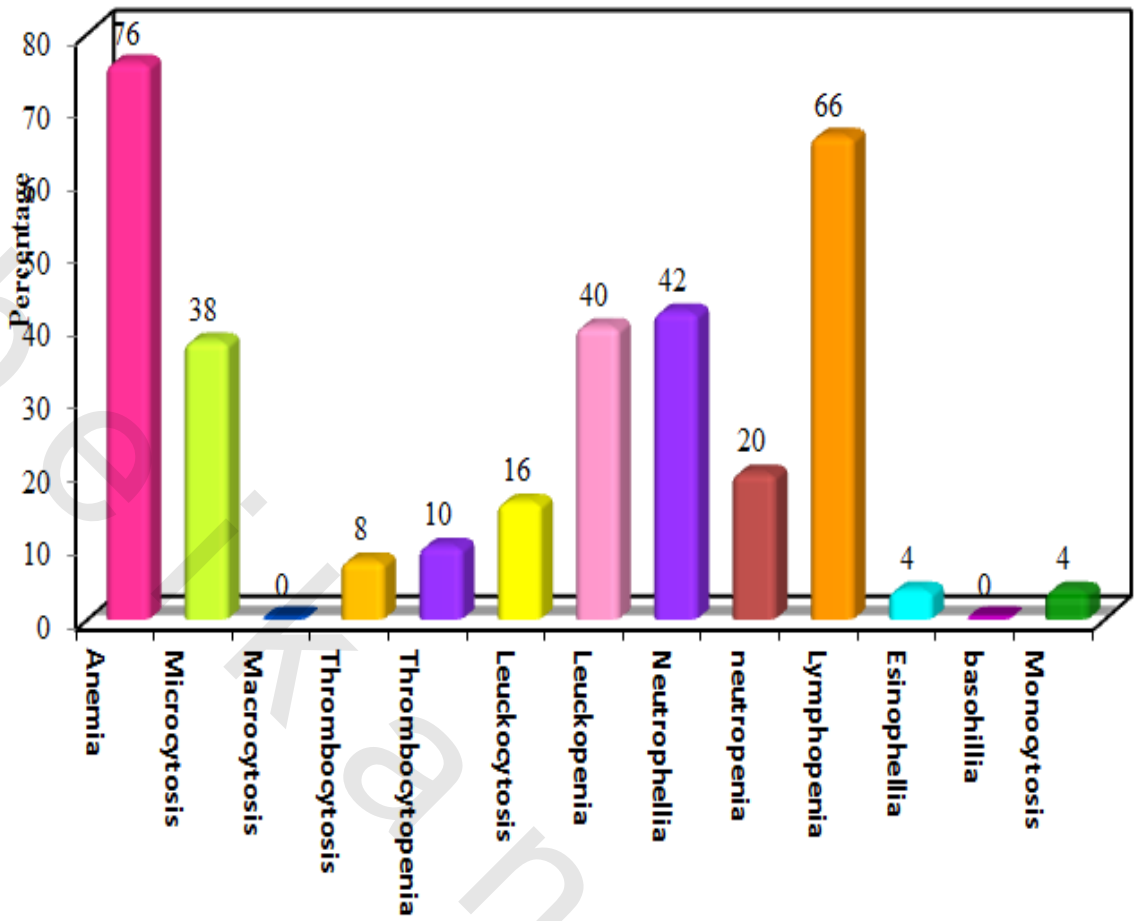

Figure (10): Hematological parameters of the studied patients

IV) Imaging data

Table (XII): Distribution of studied patients according to imaging study

	No.	%
X-RAY chest		
Normal	12	24.0
Increase bronchovascular marking	13	26.0
Opacity of upper zone of LT lung	8	16.0
Opacity of upper zone RT lung	4	8.0
Opacity of lower zones	6	12.0
Ground glass appearance	7	14.0
Ultrasound Abdomen		
Normal	29	58.0
Hepatomegaly	12	24.0
Splenomegaly	1	2.0
Hepatosplenomegaly	6	12.0
Intra-abdominal LN	2	4.0
CT brain		
Multiple brain enhancing lesions	2	4.0

This table shows the frequency of imaging findings in the study X-ray chest, US abdomen and CT brain. As regard X-ray chest findings 24% of cases show normal x-ray,26% increase bronchovascular marking , 16% LT upper zone opacity ,8% upper RT zone opacity, 12% lower zone opacity, 14% ground glass appearance (miliary TB)

This table shows that normal abdominal ultrasound was detected in two-third of patients (58%). hepatomegaly was detected among (24%) of cases. Splenomegaly was detected in 2% of cases, and hepatosplenomegaly occurred in 6 cases and 2 cases had intra-abdominal LN.

As regard CT brain 2 cases have enhancing multiple brain lesions

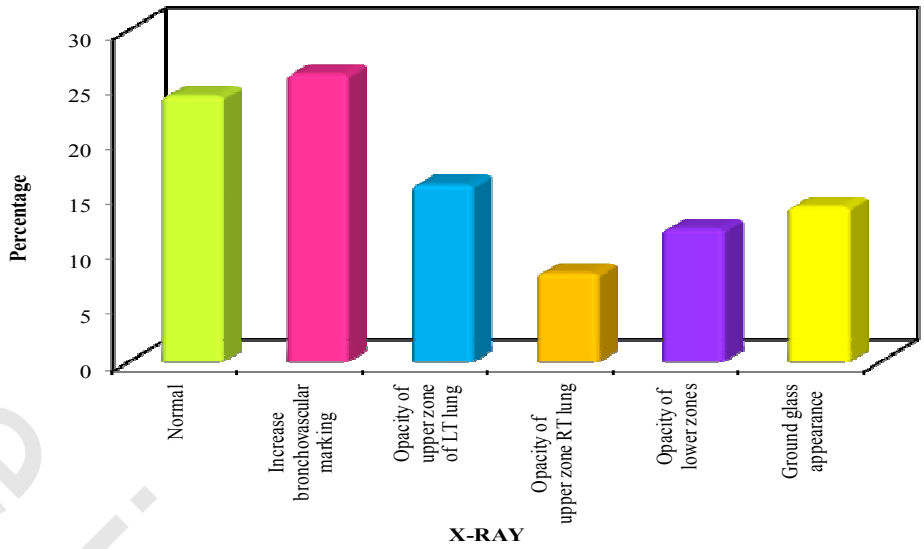

Figure (11): X-ray finding in the studied patients

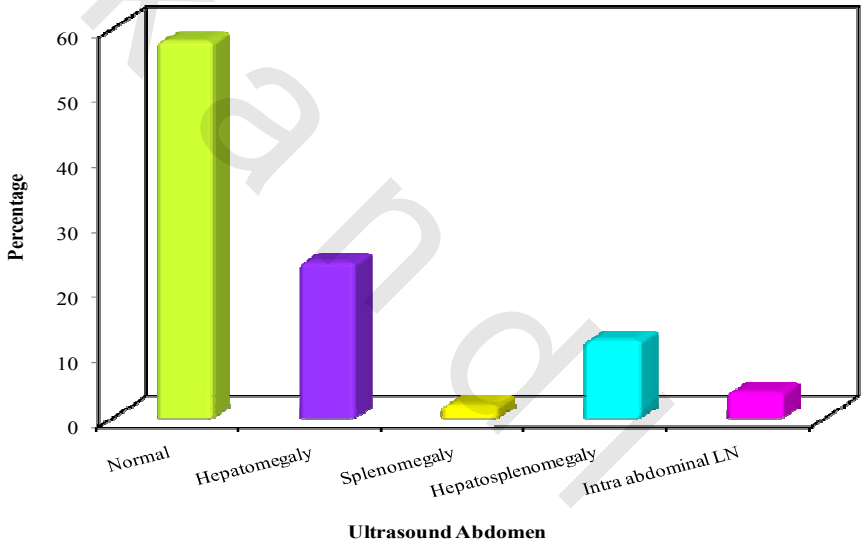

Figure (12): Ultrasound of the studied patients

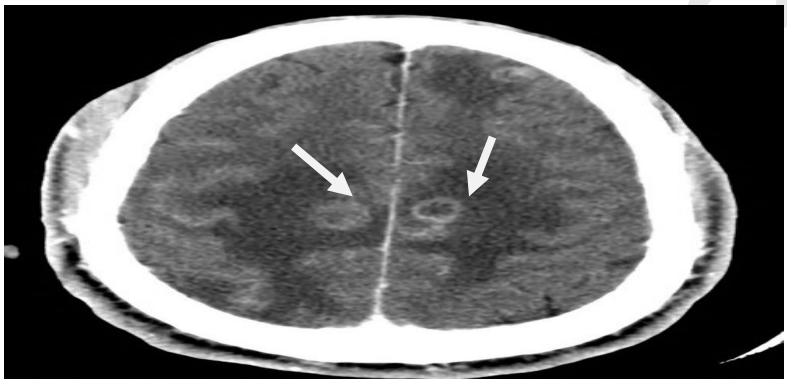

Figure (13): CT brain shows multiple enhancing brain lesions, 32years, a male patient HIV and CNS toxoplasmosis with CD4 count 50 cells/mm^3.

Table XIII: Relation between Pulmonary TB with X-RAY

		Pulmonary TB				χ^2	P
		Yes (n = 26)		No (n = 24)			
		No.	%	No.	%		
X-RAY							
Normal	12	0	0.0	12	100.0	17.105*	FE p<0.001*
Increase bronchovascular marking	13	3	23.1	10	76.9	5.888*	0.015*
Opacity of upper zone of LT lung	8	8	100.0	0	0.0	8.791*	FE p=0.004*
Opacity of upper zone RT lung	4	4	100.0	0	0.0	4.013	FE p= 0.111
Opacity of lower zones	6	5	83.3	1	16.7	2.682	0.192
Ground glass appearance	7	6	85.7	1	14.3	3.707	FE p= 0.100
χ^2(MC p)		35.484* (<0.001*)					

χ^2: value for Chi square
MC: Monte Carlo test
FE: Fisher Exact test
*: Statistically significant at p ≤ 0.05

This table shows the X- ray finding in TB patients. 3 cases increase broncho vascular marking with Statistically significant (p <0.001) , 8 cases LT upper zone opacity with Statistically significant at (p <0.015), 4 cases upper RT zone opacity, 5 cases lower zone opacity, 6 Ground glass appearance .

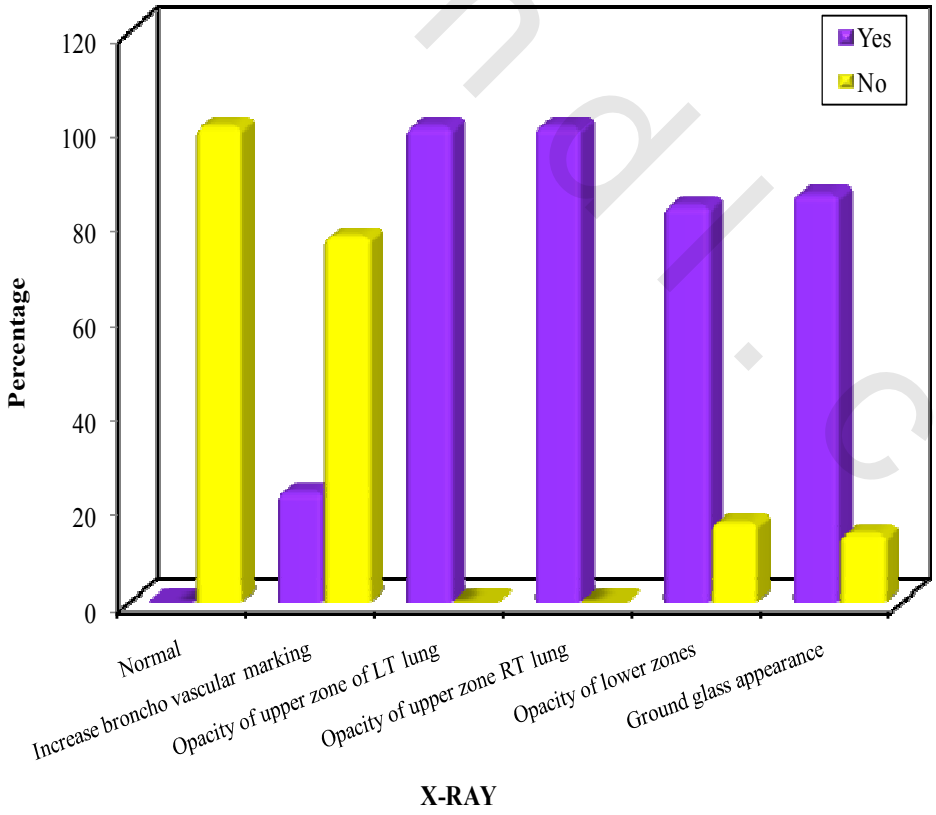

Figure (14): Relation between Pulmonary TB with X-RAY

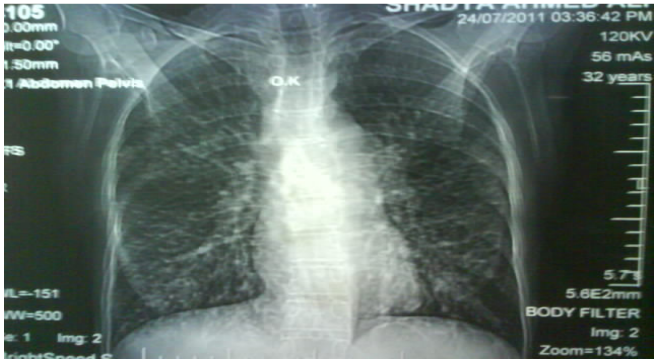

Figure (15): X-ray chest show ground glass appearance of 32 years female patient has HIV and miliary TB With CD4 count 73cells/mm^3

V) Distribution of the studied patients according to prevalence of opportunistic infections

Table XIV: Distribution of studied patients according to toxoplasma antibodies (n=2)

	Min. – Max.	Mean ± SD.	Median
IgG IU/ml	150.0 – 200.0	175.0 ± 35.36	175.0
IgM IU/ml	15.0 – 25.0	20.0 ± 7.07	20.0

This table show the toxoplasmic anti bodies that IgG only present in the two cases with median 175 Mean ± SD 175.0 ± 35.36 and no incidence of IgM this value refer to be negative.

Table XV: Distribution of studied patients according to Pulmonary TB, toxoplasmic encephalitis, oropharngeal candidiasis, kaposi sarcoma and diarrhea (n=50)

	No.	%
Oropharngeal candidiasis	32	64.0
Pulmonary TB	26	52.0
Diarrhea	17	34.0
Kaposi sarcoma	3	6.0
Toxoplasmic encephalitis	2	4.0

This table shows the prevalence of opportunistic infection in the present study .oropharngeal candidiasi is the most common opportunistic infection (64%) followed by TB (52%), diarrhea (34%), kaposi sarcoma,6% and the least one is toxoplasmic encephalitis (4%).

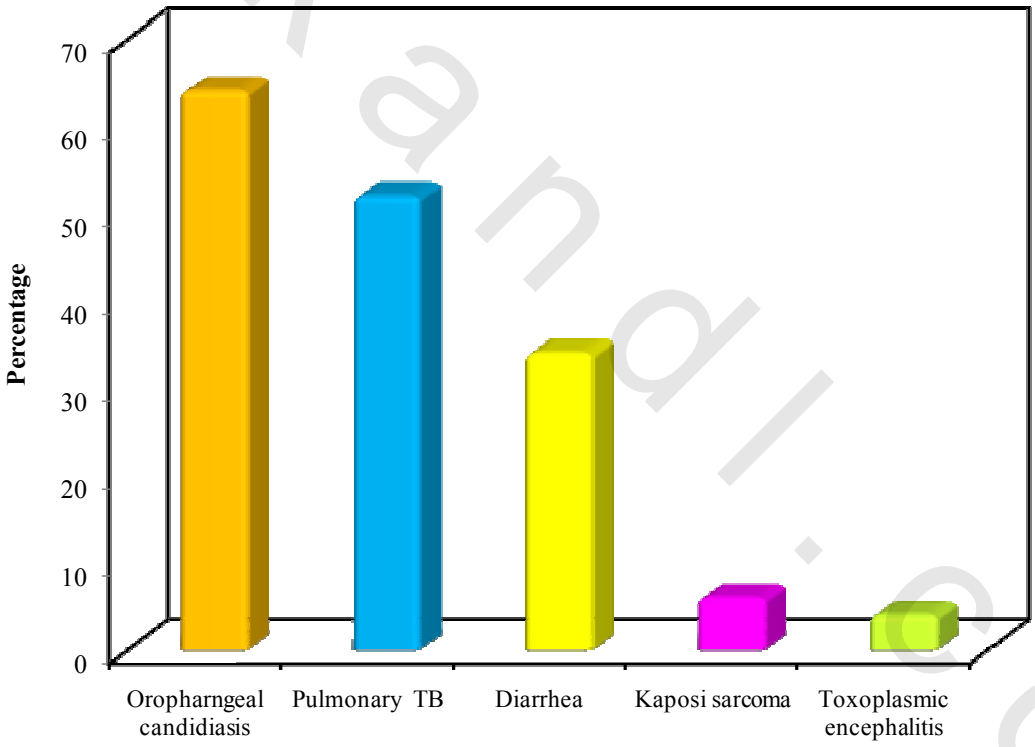

Figure (16): Distribution of studied patients according to oropharngeal candidiasis, Pulmonary TB, diarrhea, kaposi sarcoma and toxoplasmic encephalitis.

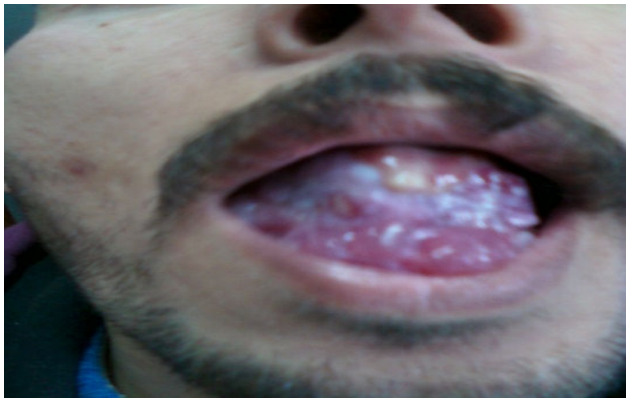

Figure (17): 31years old, male HIV patient has Kaposi sarcoma on the tongue with CD4 count 227cells/mm^3.

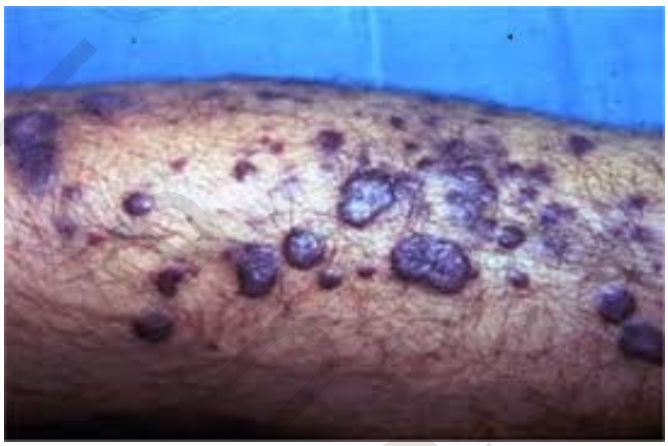

Figure (18): 41years old, male HIV patient has Kaposi sarcoma on the arm with CD4 count 74 cells/mm^3.

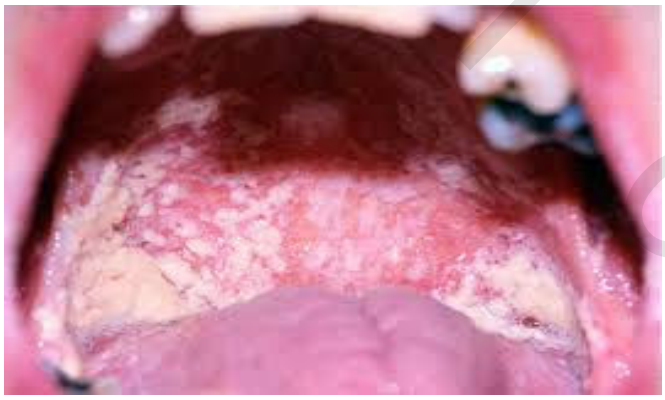

Figure (19): 46years old, male HIV patient has oral candida with CD4 35 cells/mm^3.

Table XVI: Distribution of studied parients according to infectious pathogens causing diarrhea (n=17)

	No.	%
Microsporidia spp	9	52.9
Salmonella	4	23.5
E.histolytica	3	17.6
Gardia lambelia	2	11.8
Cryptosporidium spp	2	11.8
Cyclospora	2	11.8
Isospora belli	0	0.0

This table shows the incidence of opportunistic pathogens in diarrhea in studied patients, the most common pathogen 52.3% *Micrsporidia spp*, followed by Salmonella infection (23.5%) and *E. histolytica* (17.6%). While *Gardia lambelia*, *Cryptosporidium spp*, and *Cyclospora* have the same prevalence (11.8%).No incidence of *Isospora belli*

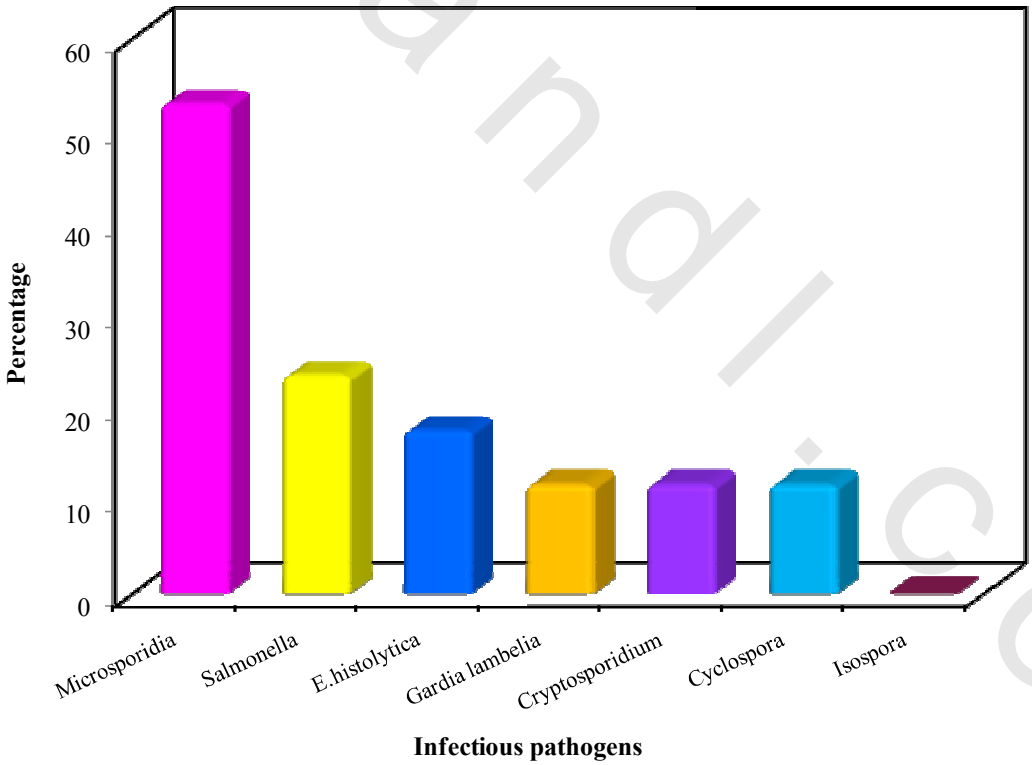

Figure (20): Distribution of studied patients according to infectious pathogens causing diarrhea.

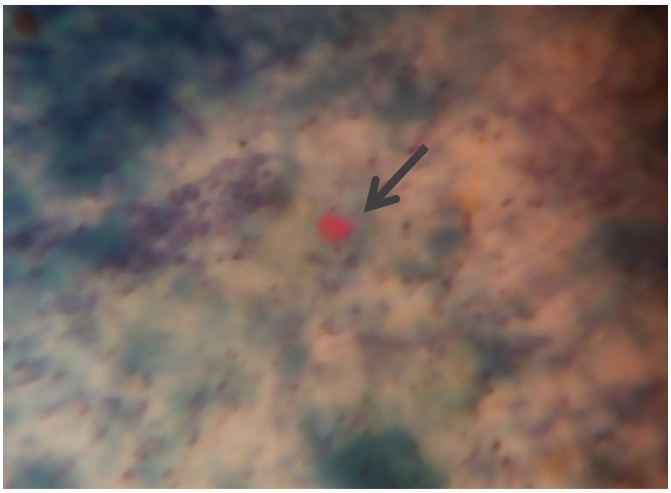

Figure (21): Modified acid fast stain shown the oocyst of *Cryptosporidium* in 31years old male HIV patient with CD4 count 11 cells/mm^3.

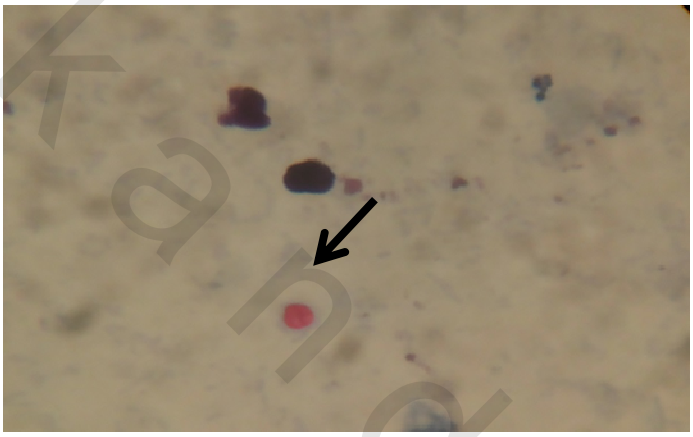

Figure (22): Modified acid fast stain shown the oocyst of *Cyclospora* in 25 years old, female patient has diarrhea with CD4 73 cells/mm^3.

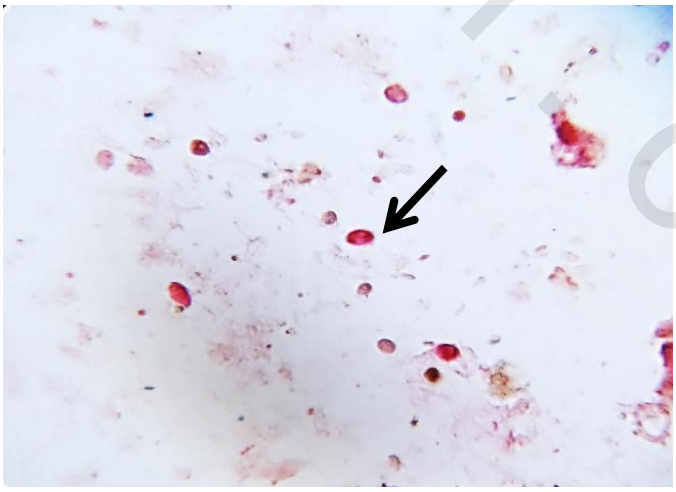

Figure (23): Modified trichrome stain shown spores of *Microsporidia* in 46 years old, male patient has diarrhea with CD4 35cells/mm^3.

VI) CD4 classification.

Table XVII: Distribution of studied patints according to CD4 classification of CDC (n=50)

	No.	%
CD4		
<200	34	68.0
≥200	16	32.0
Min. – Max.	10.0 – 489.0	
Mean ± SD.	163.80 ± 132.60	
Median	121.50	

This table shows classification of CD4 according to CDC classifications <&>200. [47] Most of patients (68%) have CD4 <200 cells/mm^3 and (32%) have CD4 >200 cells/mm^3.

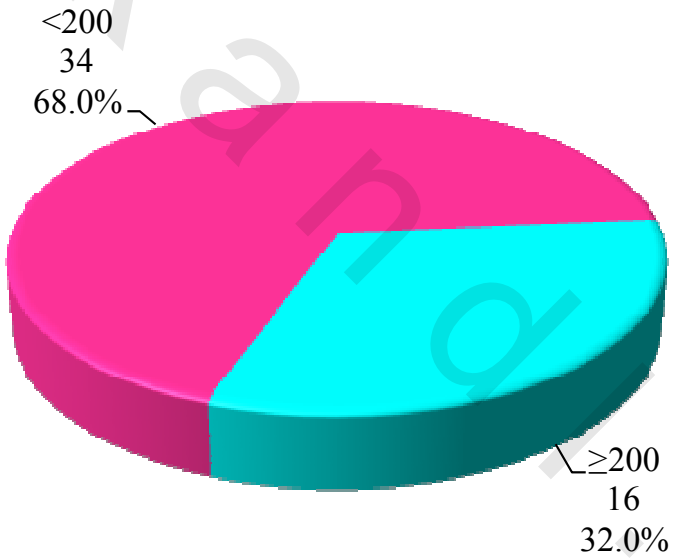

Figure (24): Distribution of studied patients according to CD4

Table XVIII: Distribution of studied patients according to CD4 in another way (n=50)

	No.	%
CD4		
<100	24	48.0
100 - <200	10	20.0
200 - <300	8	16.0
300 - <400	4	8.0
≥400	4	8.0
Min. – Max.	10.0 – 489.0	
Mean ± SD.	163.80 ± 132.60	
Median	121.50	

This table shows classification of CD4 in another way. The most frequent group of CD4 <100 cells/mm^3 present in (48%) of patients followed by CD4 100-<200 cells/mm^3 present in (20 %), 200-<300 cells/mm^3 present in (16%) and the least frequent groups were CD4 300-<400 cells/mm^3 and CD4 >400 cells/mm^3 detected in (8%).

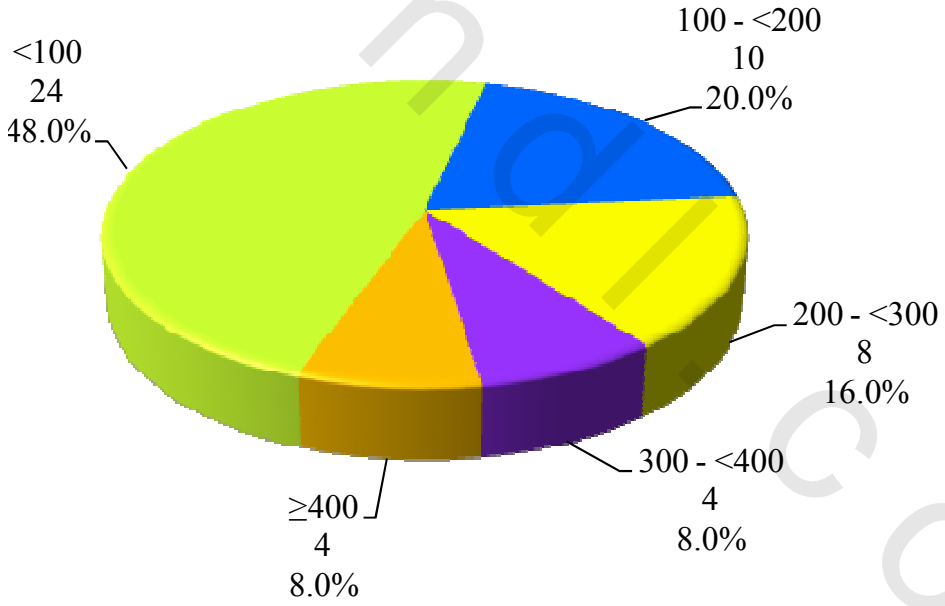

Figure (25): Distribution of studied patients according to CD4.

VII) CD4 relations

Table XIX: Relation between CD4 with pulmonary TB, toxoplasmic encephalitis, oropharngeal candidiasis, kaposi sarcoma and diarrhea

		CD4			Z	P
		Min. – Max.	Mean ± SD.	Median		
Oropharngeal candidiasis	32	10.0 – 190.0	83.34 ± 54.44	73.0	5.823*	<0.001*
Pulmonary TB	26	10.0 – 489.0	208.23 ± 158.69	194.50	1.923	0.054
Diarrhea	17	11.0 – 300.0	130.24 ± 85.60	97.0	0.871	0.384
Kaposi sarcoma	3	16.0 – 227.0	105.67 ± 109.01	74.0	0.633	0.526
Toxoplasmic encephalitis	2	48.0 – 50.0	49.0 ± 1.41	49.0	1.387	0.166

Z: Z for Mann Whitney test
*: Statistically significant at $p \leq 0.05$

This table shows the relation between the opportunistic infections and CD4 as regard median and Mean ± SD .only oropharngeal candidiasis had statistically significant relation ($p<0.001$)

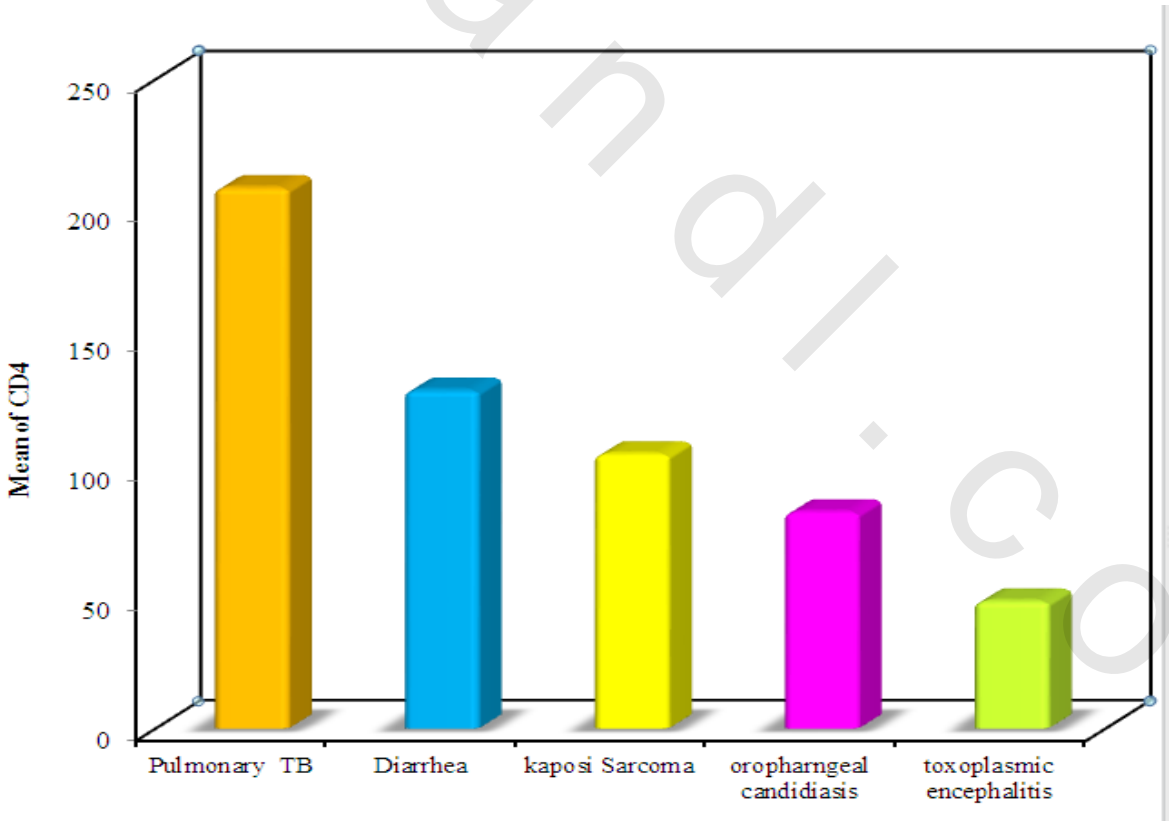

Figure (26): Relation between CD4 with pulmonary TB, toxoplasmic encephalitis, oropharngeal candidiasis, kaposi sarcoma and diarrhea

Table XX: Relation between CD4 with infectious pathogens causing diarrhea

		CD4			Z	P
		Min. – Max.	Mean ± SD.	Median		
Microsporidia	9	11.0 – 190.0	69.22 ± 55.04	73.0	3.177*	0.001*
Salmonella	4	180.0 – 300.0	231.25 ± 53.29	222.50	2.266*	0.023*
E.histolytica	3	35.0 – 196.0	101.33 ± 84.16	73.0	0.693	0.488
Gardia lambelia	2	90.0 – 217.0	153.50 ± 89.80	153.50	0.597	0.551
Cryptosporidium	2	11.0 – 183.0	97.0 ± 121.62	97.0	1.044	0.296
Cyclospora	2	73.0 – 187.0	130.0 ± 80.61	130.0	0.224	0.823
Isospora	0	-	-	-	-	-

Z: Z for Mann Whitney test
*: Statisticall
y significant at $p \leq 0.05$

This table shows the relation between CD4 and infectious pathogens of diarrhea as regard median and mean±SD of CD4 and there is a statistically significant relation between CD4 and *Microsporidia & Salmonella* (p=0.001),(p= 0.023) respectivly.

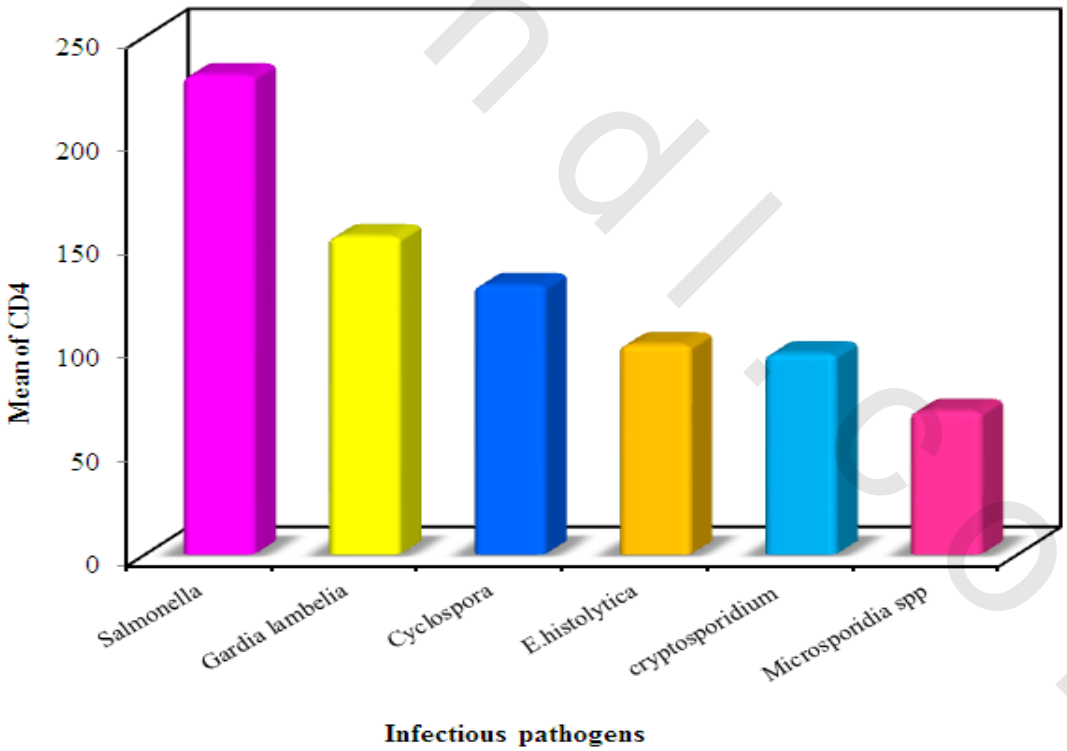

Figure (27): Relation between CD4 with infectious pathogens of diarrhea

Table XXI: Relation between opportunistic infections and CD4 according to CDC classifications.

		CD4				χ^2	P
		<200 (n = 34)		≥200 (n = 16)			
		No.	%	No.	%		
Oropharngeal candidiasis	32	32	100.0	0	0.0	41.830*	<0.001*
Pulmonary TB	26	14	53.8	12	46.2	4.987*	0.026*
Diarrhea	17	14	82.4	3	17.6	2.439	0.118
Kaposi sarcoma	3	2	66.7	1	33.3	0.003	FEp =1.000
Toxoplasmic encephalitis	2	2	100.0	0	0.0	0.980	FEp = 1.000

χ^2: Chi square test
FE: Fisher Exact test
*: Statistically significant at $p \leq 0.05$

This table shows the relation betwwen the CD4 and the occurance of the opportunistic infections according to CDC classifications. All cases of oropharngeal candidiasis occur at CD4 < 200 cells/mm^3 with a statistically significant relation (p<0.001) while most cases of pulmonary TB detected at CD4 <200 cells/mm^3 (53.8%) with Statistically significant relation p<0.026 But most of other infection detected at CD4<200 cells/mm^3 with no Statistical significance.

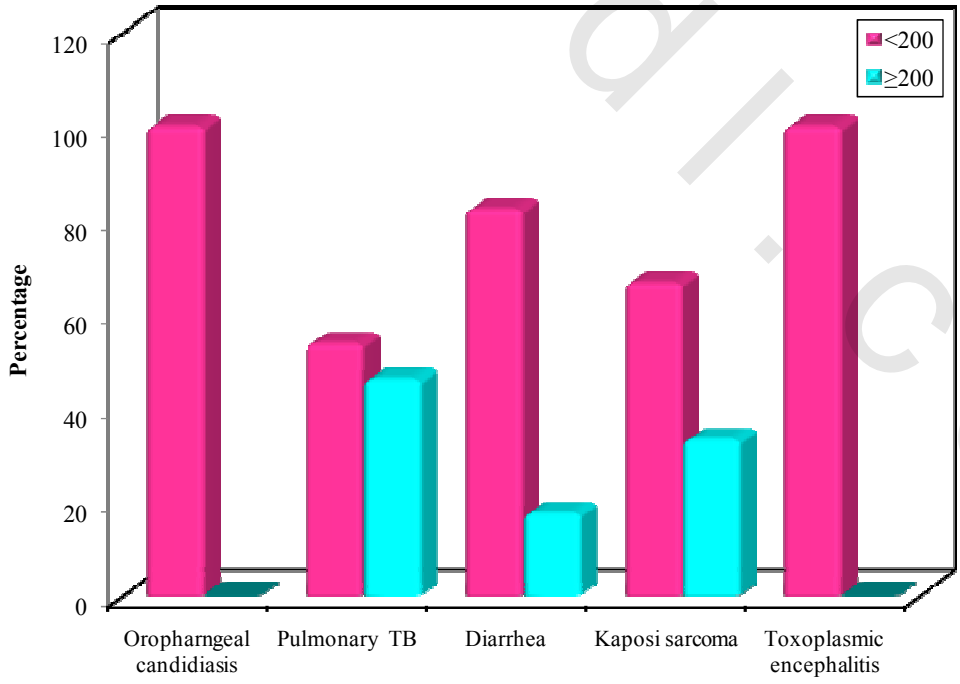

Figure (28): Relation between opportunistic infections and CD4 according to CDC classification.

Table XXII: Relation between opportunistic infections and CD4 according to another classification.

		CD4										χ^2	^{MC}p
		<100 (n = 24)		100 - <200 (n = 10)		200 - <300 (n = 8)		300 - <400 (n = 4)		≥400 (n = 4)			
		No.	%	No.	%	No.	%	No.	%	No.	%		
Oropharngeal candidiasis	32	24	75.0	8	25.0	0	0.0	0	0.0	0	0.0	45.535*	<0.001*
Pulmonary TB	26	11	42.3	3	11.5	4	15.4	4	15.4	4	15.4	9.110*	0.042*
Diarrhea	17	9	52.9	5	29.4	2	11.8	1	5.9	0	0.0	3.378	0.501
Kaposi sarcoma	3	2	66.7	0	0.0	1	33.3	0	0.0	0	0.0	2.096	0.859
Toxoplasmic encephalitis	2	2	100.0	0	0.0	0	0.0	0	0.0	0	0.0	2.247	1.000

χ^2: Chi square test
MC: Monte Carlo test
*: Statistically significant at $p \leq 0.05$

This table shows relation of opportunistic infections to CD4 in another classification. Also in this classification only pulmonary TB and candida has statistically significant relation with CD4 (p= 0.042), (p<0.001) respectively, in this table the most common opportunistic infection detected at CD4 <100cells/mm^3 was candida (24) case followed by TB, diarrhea were 11, 9 cases respectively.

Table XXIII: Relation between infectious pathogens causing diarrhea and CD4 according to CDC classifications.

		CD4				χ^2	^{FE}p
		<200 (n = 13)		≥200 (n = 4)			
		No.	%	No.	%		
Microsporidia	9	9	100.0	0	0.0	5.885*	0.029*
Salmonella	4	1	25.0	3	75.0	7.702*	0.022*
E.histolytica	3	3	100.0	0	0.0	1.121	0.541
Gardia lambelia	2	1	50.0	1	50.0	0.888	0.426
Cryptosporidium	2	2	100.0	0	0.0	0.697	1.000
Cyclospora	2	2	100.0	0	0.0	0.697	1.000
Isospora	0	0	0.0	0	0.0	-	-

χ^2: value for Chi square
FE: Fisher Exact test

This table shows the relation of the causetive agents of diarrhea and CD4 according to CDC classification. Most of opportunistic parasites occur at CD4 <200 cells/mm^3 *Microsporidia, Cryptosporidia , Cyclospora and E histolytica* while Salmonella most of the cases detected at CD4 >200 cells/mm^3 and half cases of *Gardia lambelia* detected at CD4 >200 cells/mm3. There is Statistically significant relation only with microsporidia and sallmonella (p=0.029),(p= 0.022) respectivly

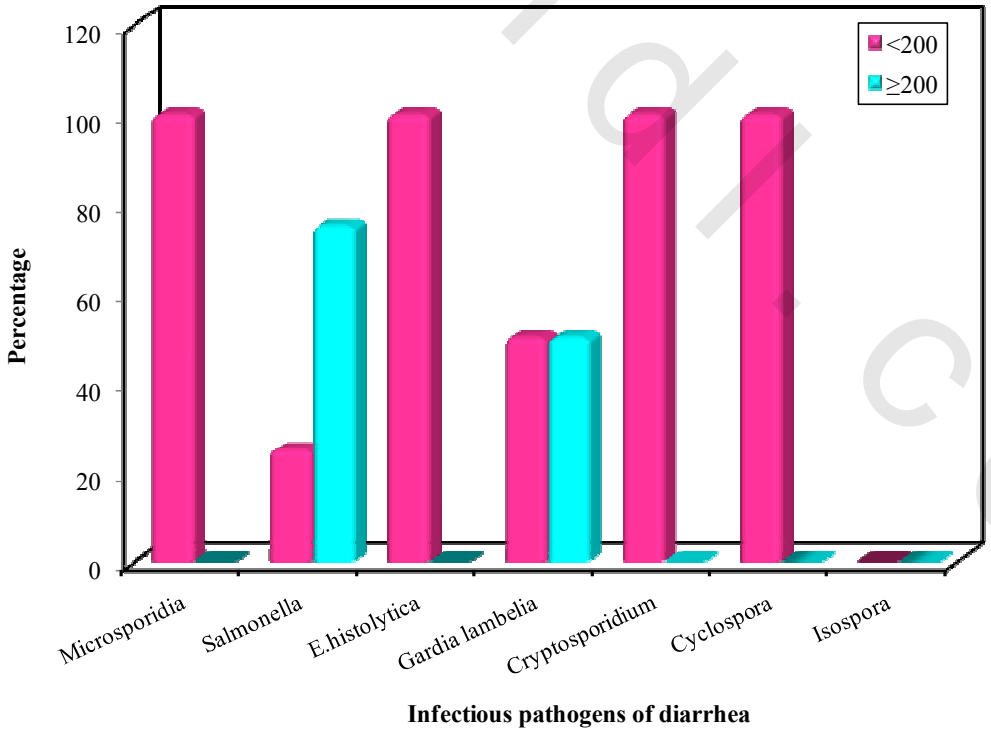

Figure (29): Relation between infectious pathogens causing diarrhea and CD4 according to CDC classification.

Table XXIV: Relation between infectious pathogens causing diarrhea and CD4 in another classification

		CD4										χ^2	^{MC}p
		<100 (n = 8)		100 - <200 (n = 5)		200 - <300 (n = 3)		300 - <400 (n = 1)		≥400 (n = 1)			
		No.	%	No.	%	No.	%	No.	%	No.	%		
Microsporidia	9	8	88.9	1	11.1	0	0.0	0	0.0	0	0.0	13.680*	<0.001*
Salmonella	4	0	0.0	1	25.0	2	50.0	1	25.0	0	0.0	8.811*	0.019*
E.histolytica	3	2	66.7	1	33.3	0	0.0	0	0.0	0	0.0	1.479	1.000
Gardia lambelia	2	1	50.0	0	0.0	1	50.0	0	0.0	0	0.0	2.797	0.503
Cryptosporidium	2	1	50.0	1	50.0	0	0.0	0	0.0	0	0.0	1.775	1.000
Cyclospora	2	1	50.0	1	50.0	0	0.0	0	0.0	0	0.0	1.775	1.000
Isospora	0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	-	-

χ^2: Chi square test
MC: Monte Carlo test
*: Statistically significant at $p \leq 0.05$

This table shows the relation the causetive agents of diarrhea and CD4 in another classification. Most of microsporidia cases detected at CD4<100 cells/mm3 (88.9%) but salmonella has no cases detected at CD4<100 cells/mm^3. While only half cases of *Cyclospora, Cryptosporidium and Gardia lambelia* detected at CD4 <100 cells/mm^3. There is Statistically significant relation only with microsporidia and sallmonella (p=0.019) , p(<0.001) respectivly

Table XXV: Relation between chest X-RAY and CD4 according to CDC classification.

		CD4				χ^2	^{FE}p
		<200 (n = 34)		≥200 (n = 16)			
		No.	%	No.	%		
X-RAY							
Normal	12	9	75.0	3	25.0	0.356	0.728
Increase broncho vascular marking	13	10	76.9	3	23.1	0.643	0.508
Opacity of upper zone of LT lung	8	2	25.0	6	75.0	8.093*	0.009*
Opacity of upper zone RT lung	4	1	25.0	3	75.0	3.694	0.091
Opacity of lower zones	6	5	83.3	1	16.7	0.737	0.650
Ground glass appearance	7	7	100.0	0	0.0	3.830	0.081
$\chi^2(^{MC}p)$		13.425* (0.010*)					

χ^2: value for Chi square
MC: Monte Carlo test
FE: Fisher Exact test
*: Statistically significant at $p \leq 0.05$

This table shows the relation between X-ray CD4 according to CDC classifications in all studied patients . Most of normal X-ray and increase bronchovascular markins cases (75%) detected at CD4 <200 cells/mm^3. While opacity of lower zones and ground glass appearance (83.3%), (100%0 respectivly detected below CD4 200 cells/mm^3 . However (75%) of upper LT & RT zone detcted at CD4 >200 cells/mm^3.

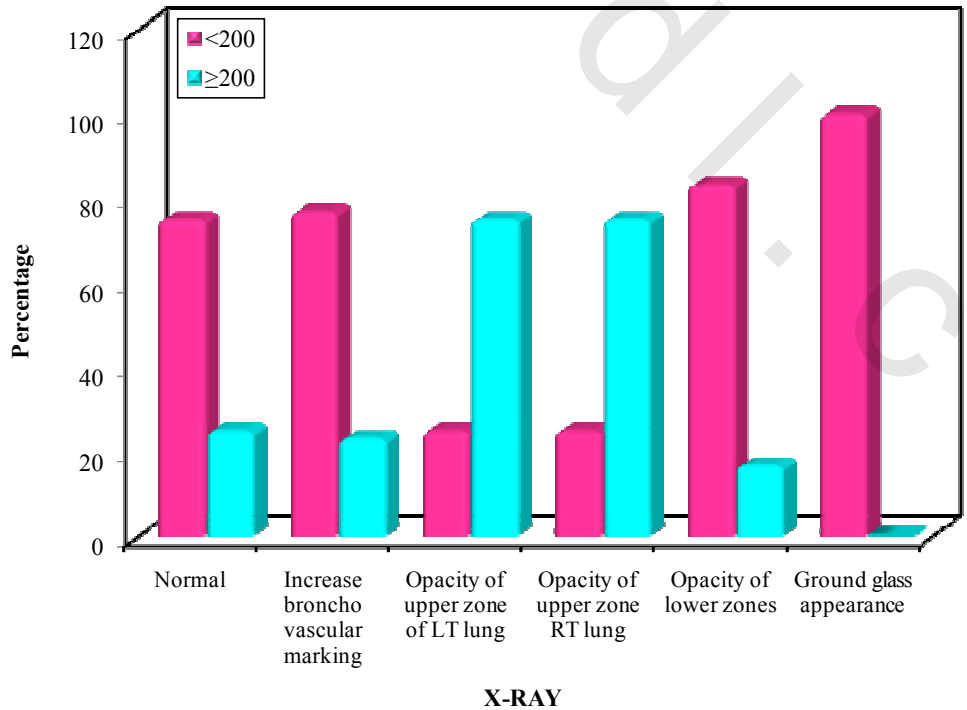

Figure (30): Relation between chest X-RAY and CD4 according to CDC classification.

Table XXVI: Relation between chest X-RAY and CD4 in another classification.

		CD4										χ^2	^{MC}p
		<100 (n = 24)		100 - <200 (n = 10)		200 - <300 (n = 8)		300 - <400 (n = 4)		≥400 (n = 4)			
		No.	%	No.	%	No.	%	No.	%	No.	%		
X-RAY													
Normal	12	5	41.7	4	33.3	3	25.0	0	0.0	0	0.0	4.861	0.390
Increase broncho vascular marking	13	8	61.5	2	15.4	2	15.4	1	7.7	0	0.0	2.270	0.835
Opacity of upper zone of LT lung	8	1	12.5	1	12.5	1	12.5	2	25.0	3	37.5	13.054*	0.004*
Opacity of upperzone RT lung	4	0	0.0	1	25.0	1	25.0	1	25.0	1	25.0	5.281	0.154
Opacity of lower zones	6	3	50.0	2	33.3	1	16.7	0	0.0	0	0.0	1.227	0.950
Ground glass appearance	7	7	100.0	0	0.0	0	0.0	0	0.0	0	0.0	6.026	0.113
$\chi^2(^{MC}p)$		26.904* (0.018*)											

χ^2: value for Chi square
MC: Monte Carlo test

This table shows the relation between chest X-ray and CD4 according to the other classification in all studied patients. most of normal X-ray and increase bronchovascular markins cases (41.7%), (61.5%) detected at CD4 <100cells/mm^3 respectivly. While ground glass appearance (100%) detected below CD4 100cells/mm^3 . However (37.5%), (25%) of upper LT & RT zones detected at CD4 >400 cells/mm^3 respectivly.

Table XXVII: Relation between ultrasound abdomen and CD4 according to CDC classification

		CD4				χ^2	P
		<200 (n = 34)		≥200 (n = 16)			
		No.	%	No.	%		
Ultrasound Abdomen							
Normal	29	17	58.6	12	41.4	2.791	0.095
Hepatomegaly	12	11	91.7	1	8.3	4.064	0.074
Splenomegaly	1	1	100.0	0	0.0	0.480	$^{FE}p = 1.000$
Hepatosplenomegaly	6	4	66.7	2	33.3	0.006	$^{FE}p = 1.000$
Intra-abdominal LN	2	1	50.0	1	50.0	0.310	$^{FE}p = 0.542$
$\chi^2(^{MC}p)$		5.472 (0.209)					

χ^2: value for Chi square
MC: Monte Carlo test
FE: Fisher Exact test

This table shows the relation between US abomen and CD4 according to CDC classification . only one case of splenomegaly present and detected at CD4 <200 cells/mm^3. Hepatomegaly was the most common detected finding (91.7%) at CD4< 200cells/mm^3 followed by hepatosplenomegaly (66.7%) , normal US (58.6%) and (50 %) intra-abdominal LN.

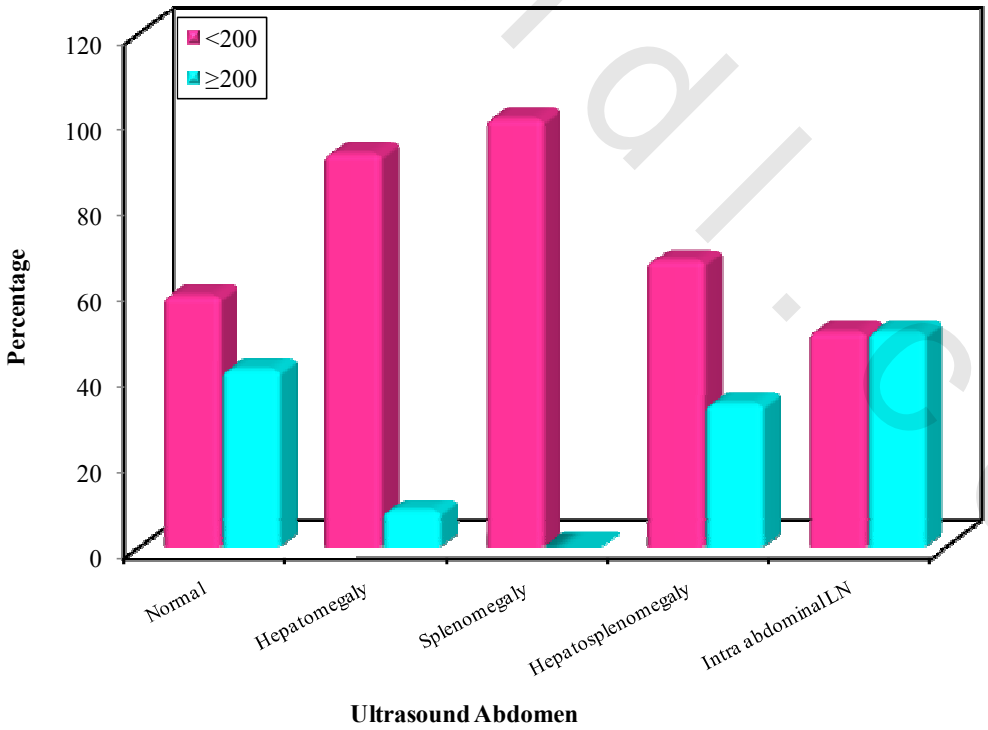

Figure (31): Relation between ultrasound abdomen and CD4 according to CDC classifications

Table XXVIII: Relation between ultrasound abdomen and CD4 according to another classification

		CD4										χ^2	^{MC}p
		<100 (n = 24)		100 - <200 (n = 10)		200 - <300 (n = 8)		300 - <400 (n = 4)		≥400 (n = 4)			
		No.	%	No.	%	No.	%	No.	%	No.	%		
Ultrasound Abdomen													
Normal	29	11	37.9	6	20.7	6	20.7	2	6.9	4	13.8	5.426	0.262
Hepatomegaly	12	9	75.0	2	16.7	1	8.3	0	0.0	0	0.0	5.592	0.368
Splenomegaly	1	1	100.0	0	0.0	0	0.0	0	0.0	0	0.0	1.105	1.000
Hepatosplenomegaly	6	3	50.0	1	16.7	1	16.7	1	16.7	0	0.0	1.231	0.901
Intra abdominal LN	2	0	0.0	1	50.0	0	0.0	1	50.0	0	0.0	7.031	0.162
$\chi^2(^{MC}p)$		15.663 (0.475)											

χ^2: value for Chi square
MC: Monte Carlo test

This table shows the relation between US abomen and CD4 according to other classification . the only one case of splenomegaly detected at CD4 <100 cells/mm^3. Hepatomegaly was the most common finding (75%) deteceted at CD4< 100 cells/mm^3 followed by hepatosplenomegaly (50%) , normal US (37.9%) .while intra-abdominal LNdetected at CD4 >100 cells/mm^3.

Table XXIX: Relation between chest X-RAY in pulmonary TB cases and CD4 according to CDC classification

		CD4				χ^2	^{FE}p
		<200 (n = 14)		≥200 (n = 12)			
		No.	%	No.	%		
X-RAY							
Normal	0	0	0.0	0	0.0	-	-
Increase broncho vascular marking	3	1	33.3	2	66.7	0.574	0.580
Opacity of upper zone of LT lung	8	2	25.0	6	75.0	3.869	0.090
Opacity of upper zone RT lung	4	1	25.0	3	75.0	1.583	0.306
Opacity of lower zones	5	4	80.0	1	20.0	1.704	0.330
Ground glass appearance	6	6	100.0	0	0.0	6.686*	0.017*
$\chi^2(^{MC}p)$		10.823* (0.020*)					

χ^2: value for Chi square
MC: Monte Carlo test
FE: Fisher Exact test
*: Statistically significant at $p \leq 0.05$

This table shows the relation between chest X –ray findings in TB patients and CD4 according to CDC classification which has statistically significant relation between the occurrence of different chest X-ray findings below and above CD4 200 cells/mm^3 (p=0.020). The most detected findings at CD4 <200 cells/mm^3 was the miliary TB 100% with statistically significant relation with CD4 <200 cells/mm^3 (p=0.017) followed by lower zone opacity was (80%) detected at CD4 <200 cells/mm^3 but with no statistical significance. However, opacity of upper LT & RT zones of lung was (75%) detected at CD4>200 cells/mm^3.

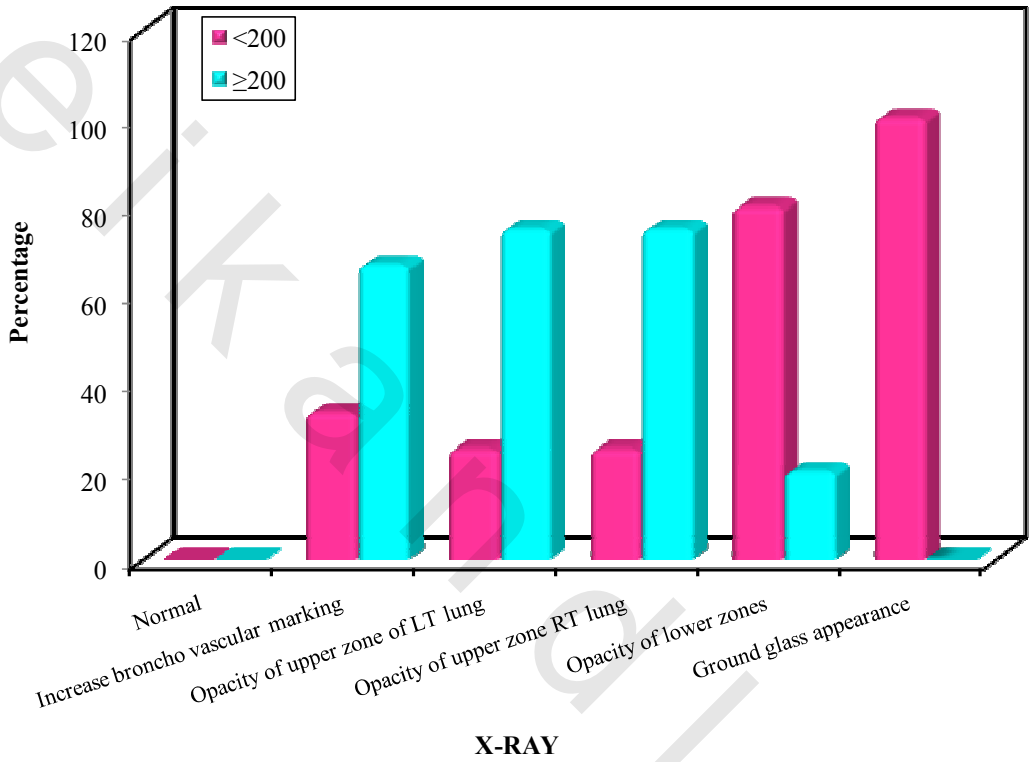

Figure (32): Relation between chest X-RAY in pulmonary TB cases and CD4 according to CDC classification.