



A Study Of Cd4 Count Profile In Pulmonary And Extra Pulmonary Tuberculosis In A Tertiary Health Care Centre

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Abstract:

Background: Tuberculosis (TB) is caused by bacteria (*Mycobacterium tuberculosis*) which most commonly affects the lungs. Tuberculosis is curable and preventable. Replication of mycobacterium is more common in immunocompromised condition, CD4 T cells are also known as T helper cells which are functional cells for executing immune function. T-cells are a subset of white blood cells that play an important role in the body's immune system. CD4 is a type of protein found on the certain immune cells like T-cells, macrophages, and monocytes. In this study CD4 count in TB patients are assessed.

Materials And Methods: This cross sectional study was conducted at Sri Ramachandra Medical College and Hospital. Centre, Sample size was 74.

Result: Out of 74 patients 49% are below 40 years of age, 32% are between 41-60 years and 19% belong to above 60 years. 20% patients had CD4 count of above 1000, 35% had CD4 count below 400 and 44 % patients had CD4 count of between 400-1000.

Conclusion: Statistically significant reduction in CD4 and ALC count in smokers is Suggestive of Smoking Interferes with pulmonary immunology.

INTRODUCTION TUBERCULOSIS

Tuberculosis is known since vedic era in India as –Kshaya (decay) Roga. Hippocrates described it as Phthisis .It was discovered by Robert Koch on 24 th march 1882 which is celebrated as World TB day.It (TB) is caused by bacteria (*Mycobacterium tuberculosis*) which most commonly affects the lungs. Tuberculosis is curable and preventable. One quarter of the world population has latent TB. In 90% of the cases Maintenance of equilibrium between bacterial defense system and host immune response is the cause for latency throughout life of infected person, without causing full blown disease. When the host is immunocompromised there is intense reproduction of mycobacteria which occurs in 10 % of cases^{1,2}.

CD4 T cells are also known as T helper cells which are functional cells for executing immune function. T-cells are a subset of white blood cells that play an important role in the body's immune system. CD4 is a type of protein found on the certain immune cells like T-cells, macrophages, and monocytes.

CD4 cells do not neutralize infections but rather trigger the body's response to infections hence considered as helper cells. CD8 T-cells—classified as such because of the type of protein on their surface, CD8 T cells play the part of "killer" cells by producing antibodies that help fight off viruses and other foreign invaders. Some plays major role in activating macrophage and dendritic cells during early infection, while others direct immune defenses when faced, individually, with parasitic organisms, bacteria, or viruses³.

CD4 cells plays a crucial role in achieving a regulated and effective immune response to pathogens. Naive CD4⁺T cells are activated After interacting with antigen-MHC complex and differentiated into specific subtypes depends mainly on the cytokine milieu of the micro environment.

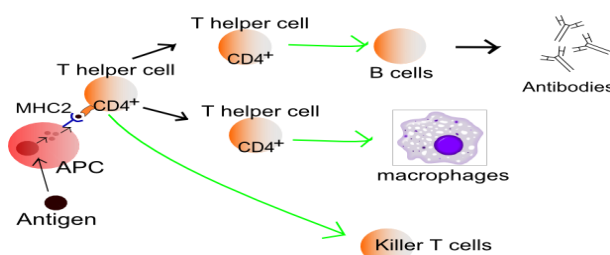


Figure 1

Classical T-helper cells are T-helper 1 and T-helper 2, other subsets have been identified, which includes T-helper 17, regulatory T cell, follicular helper T cell, and T-helper 9, each has a characteristic cytokine profile. The effector functions of these cells are mediated by the cytokines secreted by the differentiated cells⁴.

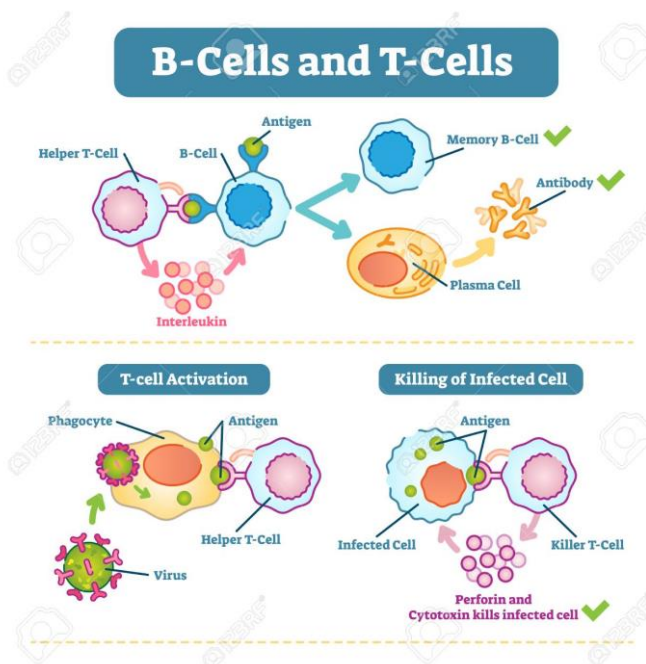


Figure 2

MATERIALS AND METHODOLOGY

Site of study:

Sri Ramachandra Institute of Higher Education and Research, Porur, Chennai.

Type of study:

A hospital based Cross sectional clinical study.

Period of study:

2017 to 2019.

Sample size:

70 cases.

Inclusion criteria:

- Smear positive or culture positive pulmonary tuberculosis
- Extra pulmonary tuberculosis with positive histopathology
- Radiologically active pulmonary tuberculosis

Exclusion criteria:

- HIV
- Chronic kidney disease(CKD)
- Diabetes (Type I-II)
- Chronic steroid therapy or other immuno suppressive drugs
- Patient not willing to be part of the study.

OBLIGATORY CRITERIA

- Sputum AFB Positive
- FNAC/Biopsy- Caseating Granuloma
- Gene xpert Positive- Sputum, Pleural fluid, CSF, Lymph node
- Chest X Ray PA view-Cavitary lesion, Consolidation, Millitary pattern

OTHER CRITERIA (AT LEAST TWO OF THREE)

- Sputum AFB Positive.
- FNAC/Biopsy-Caseating Granuloma.

Method

All subjects with detailed clinical history and physical examination, age, gender, respiratory symptoms, chest radiograph, FNAC/Biopsy and sputum smear examination suggestive of pulmonary, extra pulmonary and disseminated tuberculosis have been enrolled into the study group and subjected to CD4 profile.

RESULTS

The data were collected and tabulated using Microsoft Excel, and the Statistics were analysed with the help of SPSS software. P value less than 0.05 is considered as statistically significant.

The Tables and figures are as follows

All statistical analysis were performed using Statistical Package for Social Science (SPSS, version 17) for Microsoft windows. The data were not normally distributed. And therefore parametric / Non Parametric tests were performed. Descriptive statistics were presented as numbers and percentages The data were expressed as Mean and SD. One way analysis of variance with a post hoc Tukey HSD test was used for continuous data / Krushkall’s willis test. Independent sample student t test / Mann Whitney test were used to compare continuous variables between two groups. A chi-squared test was used for comparison between two attributes. A Pearson correlation coefficient analysis was used to examine the association of two related variables. A two sided p value < 0.05 was considered statistically significant.

Level of significant.

- 95% *p < 0.05 0.02 - 0.05
 99 % **p < 0.01 0.002 – 0.01
 99.9 % ***p < 0.001 0.000 – 0.001

Table 1 AGE DISTRIBUTION

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid <= 40 YEARS	43	58.1	58.1	58.1
41 - 60 YEARS	23	31.1	31.1	89.2
> 60 YEARS	8	10.8	10.8	100.0
Total	74	100.0	100.0	

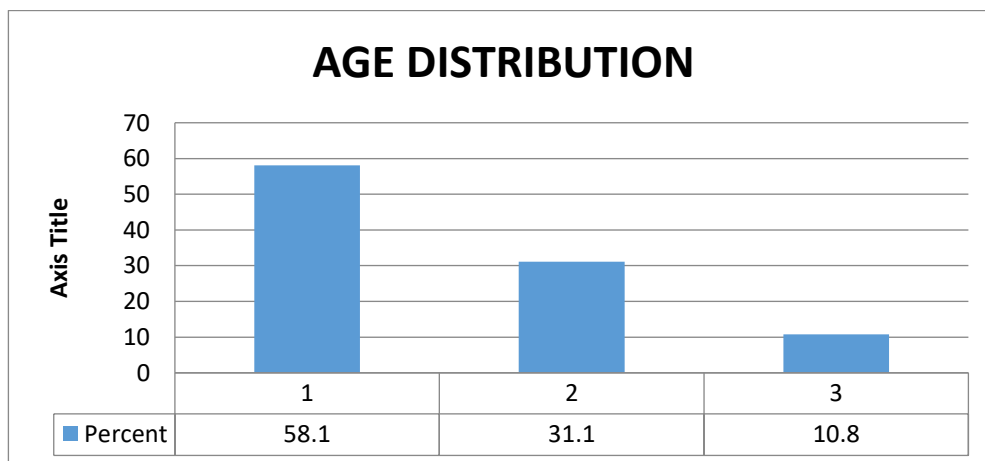


Figure 1

Table 2

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Pulmonary	38	51.4	51.4	51.4
Extrapulmonary	24	32.4	32.4	83.8
Dissiminated	12	16.2	16.2	100.0
Total	74	100.0	100.0	

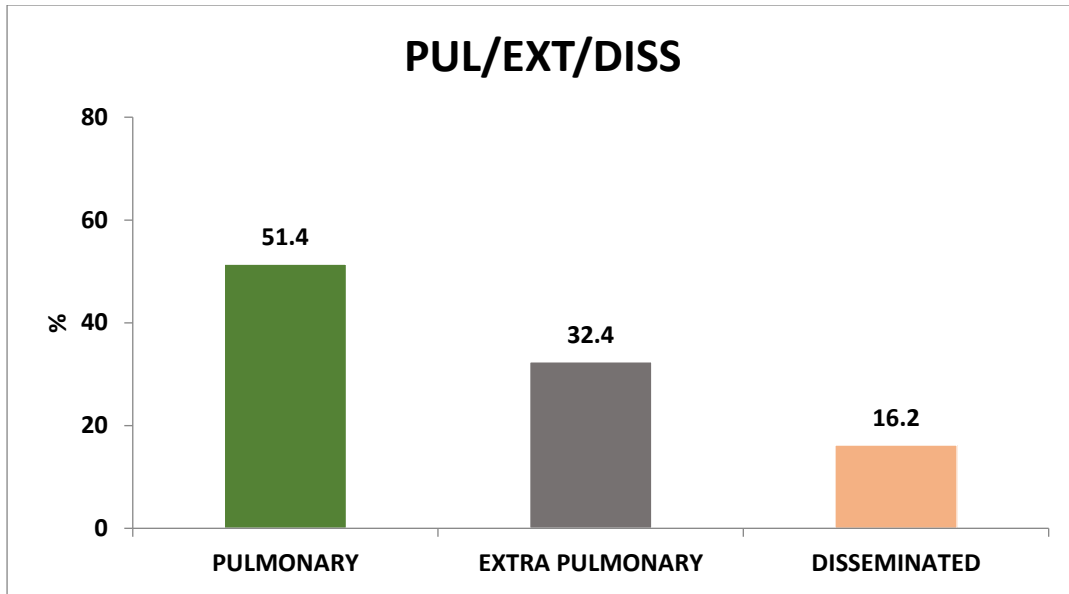


Figure 2

Table 3 CD4 CLASS * PUL/EXT/DISS Crosstabulation

CD4 CLASS		PUL/EXT/DISS			Total
		PULMONARY	EXTRA PULMONARY	DISSEMINATED	
< 400	Count	13	7	6	26
	% within CD4 CLASS	50.0%	26.9%	23.1%	100.0%
400 - 1000	Count	15	12	6	33
	% within CD4 CLASS	45.5%	36.4%	18.2%	100.0%
> 1000	Count	10	5	0	15
	% within CD4 CLASS	66.7%	33.3%	.0%	100.0%
Total	Count	38	24	12	74
	% within CD4 CLASS	51.4%	32.4%	16.2%	100.0%

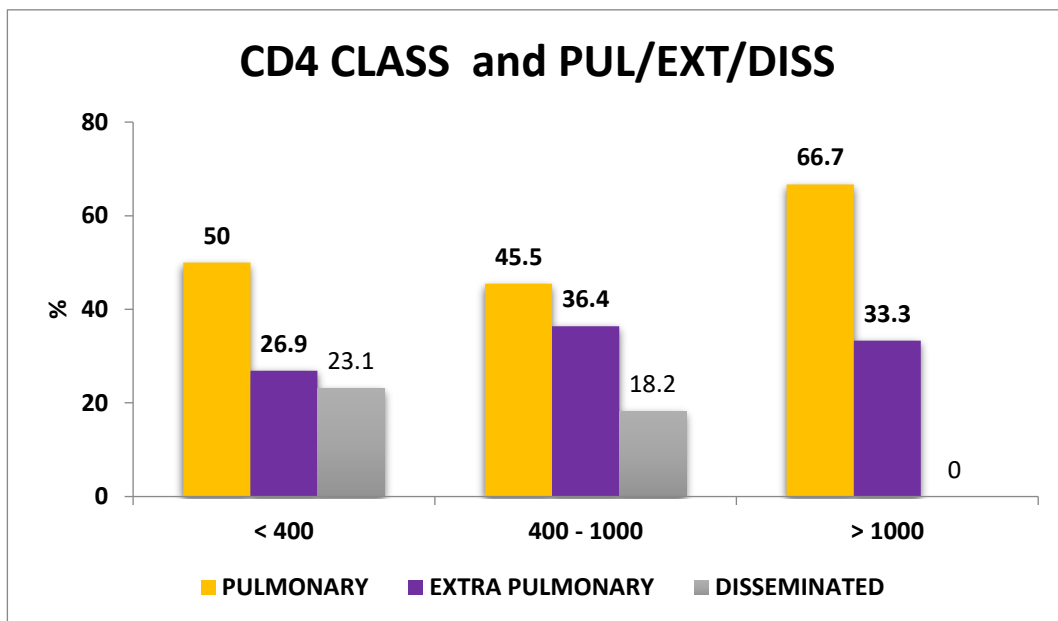


Figure 3

Table 4 Ranks

	SMOKING	N	Mean Rank	Sum of Ranks
ALC	YES	12	25.75	309.00
	NO	62	39.77	2466.00
	Total	74		
CD4 COUNT	YES	12	25.17	302.00
	NO	62	39.89	2473.00
	Total	74		

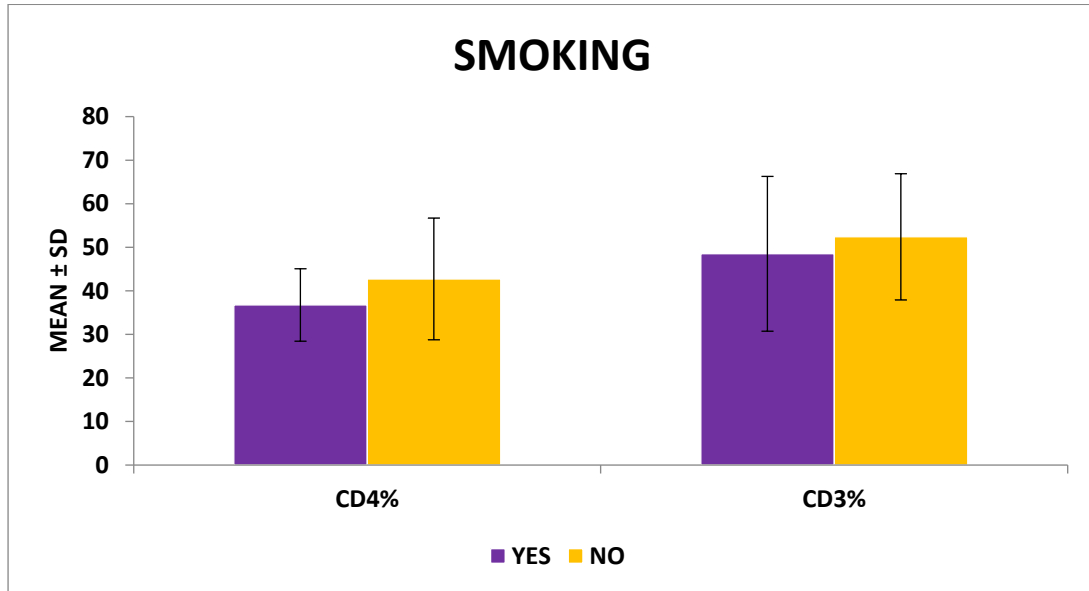


Figure 4

Table 5 Ranks

	CHEST X-RAY SIDE	N	Mean Rank	Sum of Ranks
ALC	UNILATERAL	29	31.76	921.00
	BILATERAL	22	18.41	405.00
	Total	51		
CD4 COUNT	UNILATERAL	29	31.97	927.00
	BILATERAL	22	18.14	399.00
	Total	51		



Figure 5

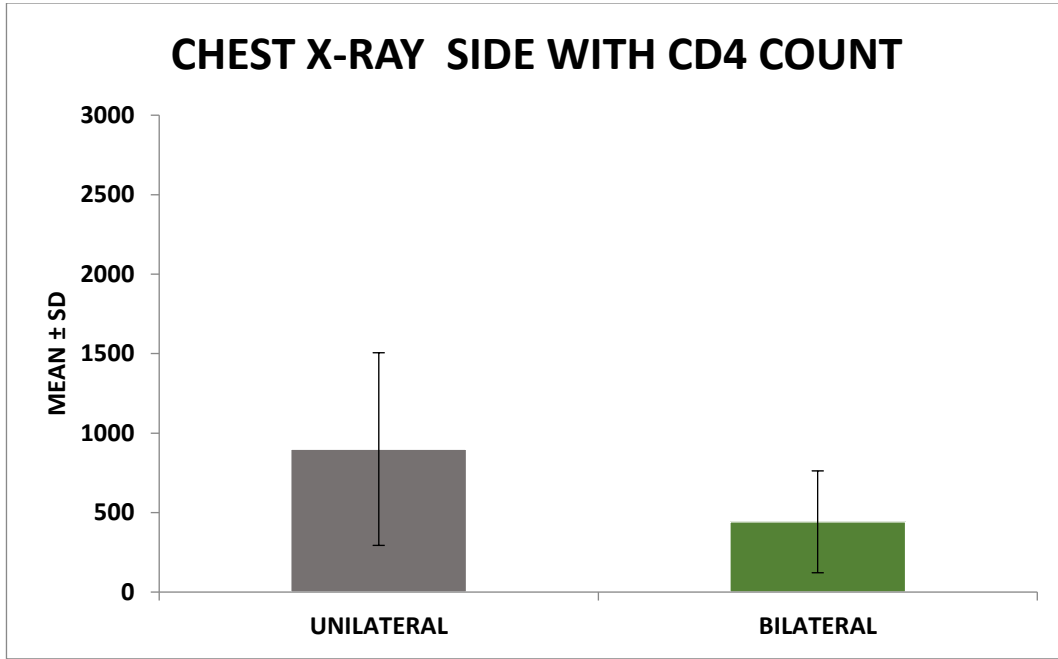


Figure 6

Table 6

	BMI CLASS	N	Mean Rank
ALC	UNDERWEIGHT	18	25.64
	NORMAL	33	40.65
	OVERWEIGHT	18	38.89
	OBESE	5	54.40
	Total	74	
CD4 COUNT	UNDERWEIGHT	18	27.58
	NORMAL	33	41.29
	OVERWEIGHT	18	37.67
	OBESE	5	47.60
	Total	74	

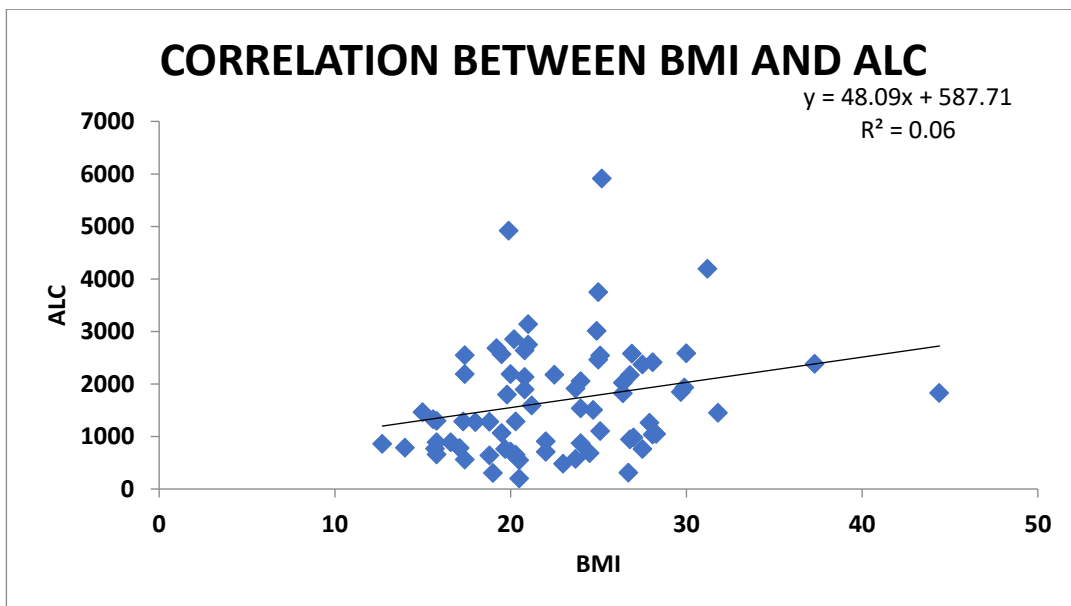


Figure 7

DISCUSSION

In this study 74 patients were taken into account, 39 male-53% and 35 female-47%. Comorbids like DM, CKD and other immunosuppressive conditions were excluded.

Out of 74 patients 49% are below 40 years of age, 32% are between 41-60 years and 19% belong to above 60 years.

Among 74 patients 38 Patients had pulmonary TB, 24 patients had extra pulmonary TB and 12 patients had disseminated TB.

20% patients had CD4 count of above 1000, 35% had CD4 count below 400 and 44 % patients had CD4 count of between 400-1000.

Among the patients with disseminated TB 6 patients had CD4count below 400,6 patients had CD4 count 400-1000 and none had above 1000 CD4 count.

There is no significant difference in CD4 count between the patients with resistant strain and patients with sensitive strain. This proves that there is no correlation between resistance and sensitivity.

Among 74 cases 62 were non smokers and 12 were smokers which is 83.8 % and 16.2 % respectively. Statistically P value (Mann Whiteny) showed significance of 0.039 in ALC and 0.030 in CD4 count –significant decrease of CD4 count and ALC seen in smokers.

X Ray Chest showed unilateral finding in 29 cases and bilateral finding in 22 cases. There is significant decrease in CD4 and ALC count in cases with bilateral X Ray finding. (P value of 0.001 in ALC and 0.001 in CD4 count.)

Out of 74 patients 15 patients were under weight, 34 patients were of Normal weight, 20 were Over weight and 5 were Obese. P value -0.025 suggestive of decrease in ALC in under weight patients.

CONCLUSION

- Statistically significant reduction in CD4 and ALC count in smokers is Suggestive of Smoking Interferes with pulmonary immunology.
- In patients with bilateral extensive Chest X ray infiltrates there is significant statistical P value reduction indicating, In extensive disease there is decrease in immune mediated system.
- In disseminated Tuberculosis no patients had CD4 count more than 1000
- Decrease in BMI showed decrease in ALC-(P value 0.025)
- In this study it was noted that Females of reproductive age group and Males of older age groups are more prone to TB.
- There was no significant difference in CD4 count between resistant and sensitive strains.

CONFLICT OF INTEREST

The authors have no conflict of interest to declare.All Co authors have seen and agree with the contents of the manuscript and there is no financial interest to report.

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FIGURE LEGENDS:

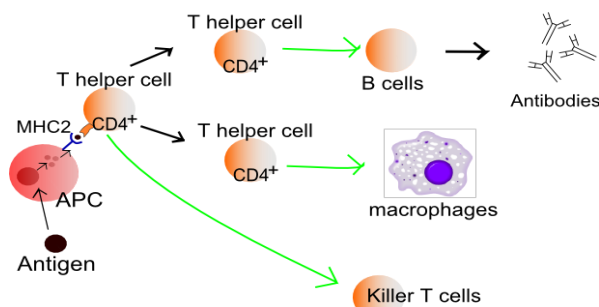


Figure:1) Helper T cells are the most important cells in immunity ,The antigens activating MHC which in turn causes activation of macrophages, B cells ect

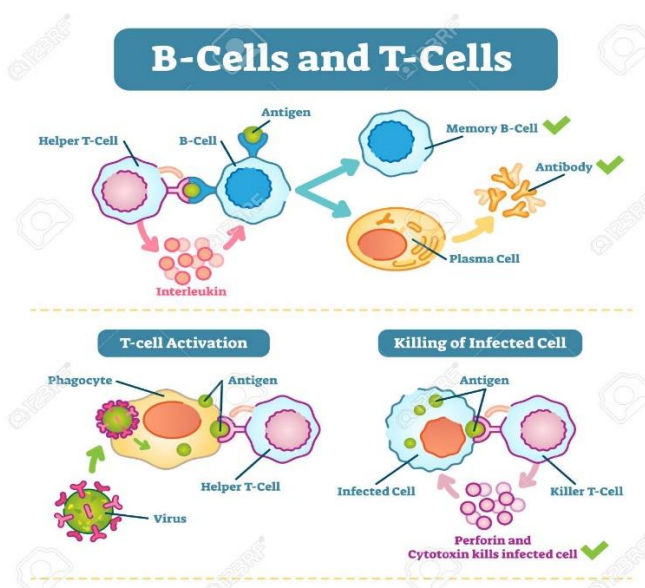


Figure:2) B cell and T cell activation by antigens.

Table 1) AGE DISTRIBUTION

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	< = 40 YEARS	43	58.1	58.1	58.1
	41 - 60 YEARS	23	31.1	31.1	89.2
	> 60 YEARS	8	10.8	10.8	100.0
	Total	74	100.0	100.0	

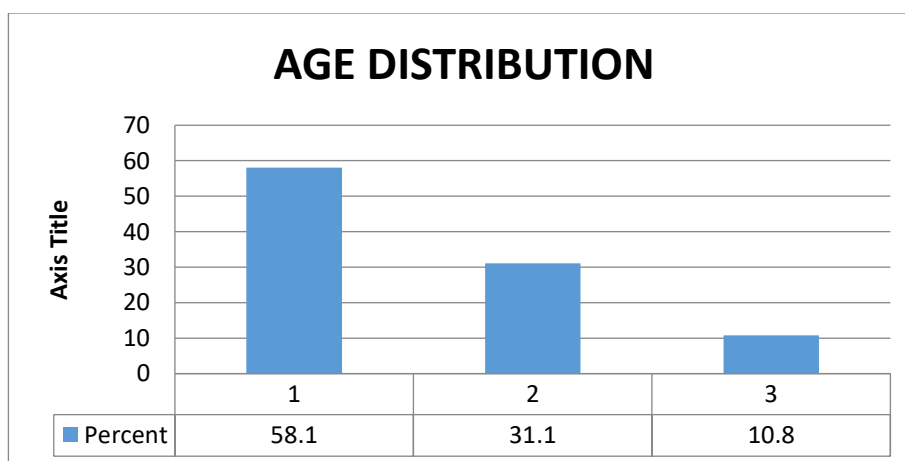


Figure 3) About 58% are above 50 years,31 % are above 30 years and 10 % young age group.

Table 2)

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Pulmonary	38	51.4	51.4	51.4
Extrapulmonary	24	32.4	32.4	83.8
Dissiminated	12	16.2	16.2	100.0
Total	74	100.0	100.0	

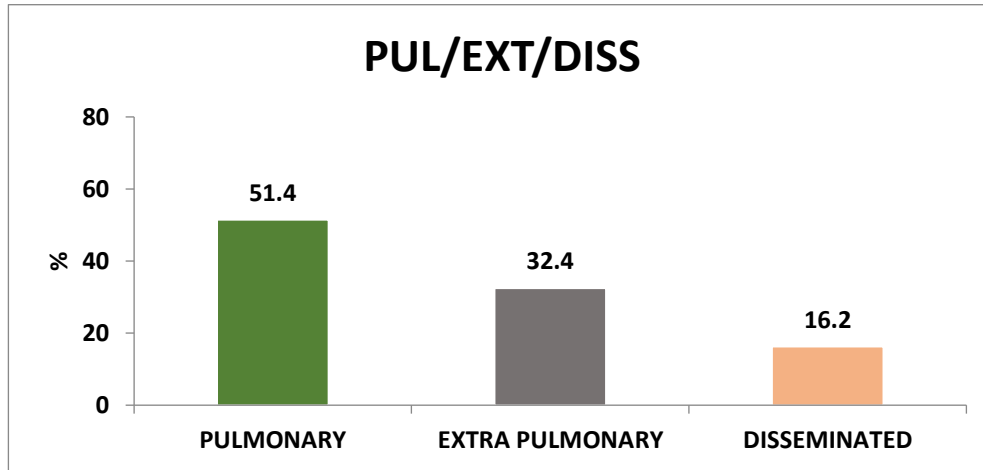


Table 3) CD4 CLASS * PUL/EXT/DISS Crosstabulation

CD4 CLASS		PUL/EXT/DISS			Total
		PULMONARY	EXTRA PULMONARY	DISSEMINATED	
< 400	Count	13	7	6	26
	% within CD4 CLASS	50.0%	26.9%	23.1%	100.0%
400 - 1000	Count	15	12	6	33
	% within CD4 CLASS	45.5%	36.4%	18.2%	100.0%
> 1000	Count	10	5	0	15
	% within CD4 CLASS	66.7%	33.3%	.0%	100.0%
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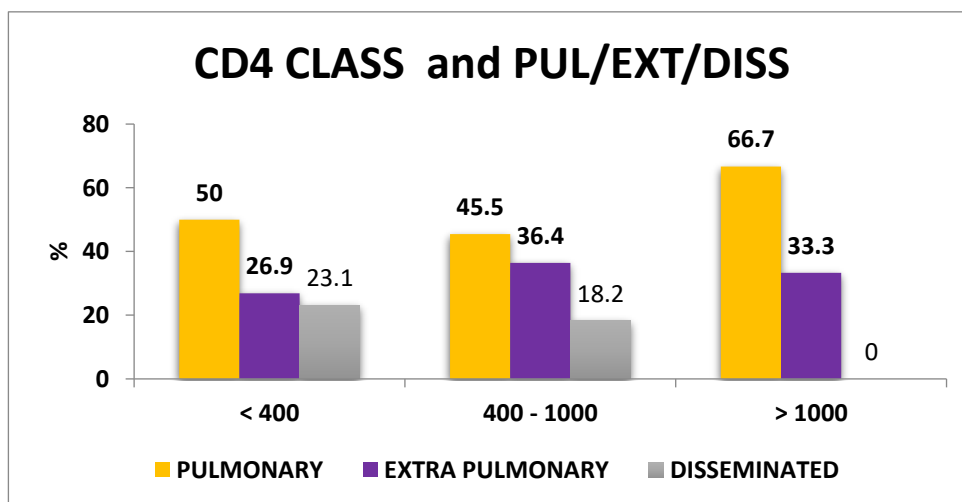


Figure 4) CD4 count is categorized into three groups depending upon their results, below 400,4000-1000 and above 1000,they are further categorized and compared with pulmonary,extra pulmonary and disseminated tuberculosis.

Table 4) Ranks

	SMOKING	N	Mean Rank	Sum of Ranks
ALC	YES	12	25.75	309.00
	NO	62	39.77	2466.00
	Total	74		
CD4 COUNT	YES	12	25.17	302.00
	NO	62	39.89	2473.00
	Total	74		

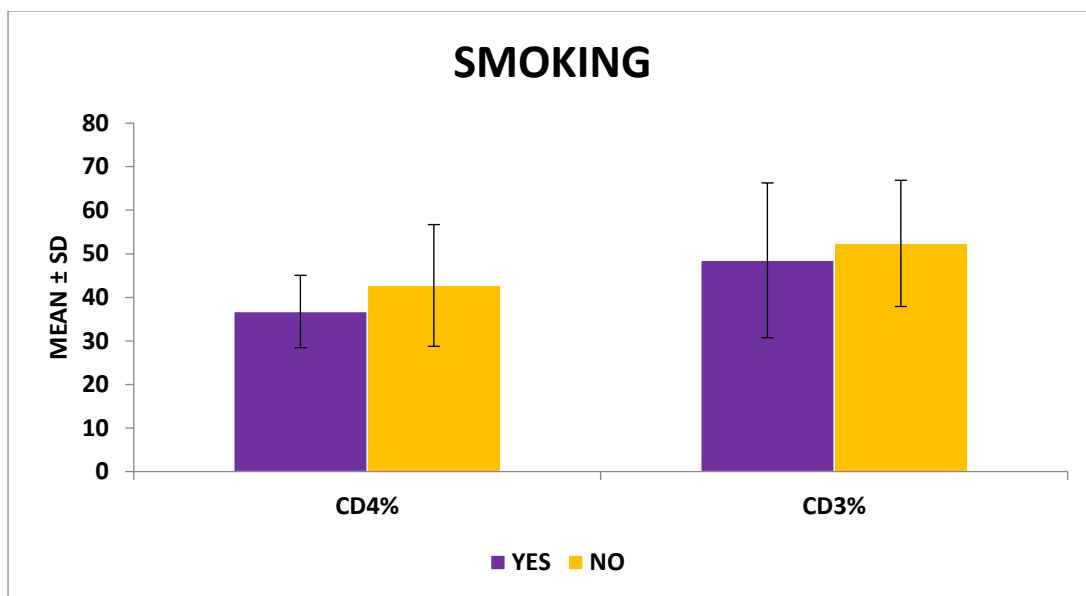


Figure 5) Comparison of CD4 Count in Patients with smoking and without smoking showing lesser CD4 count in smokers.

Table 5) Ranks

	CHEST X-RAY SIDE	N	Mean Rank	Sum of Ranks
ALC	UNILATERAL	29	31.76	921.00
	BILATERAL	22	18.41	405.00
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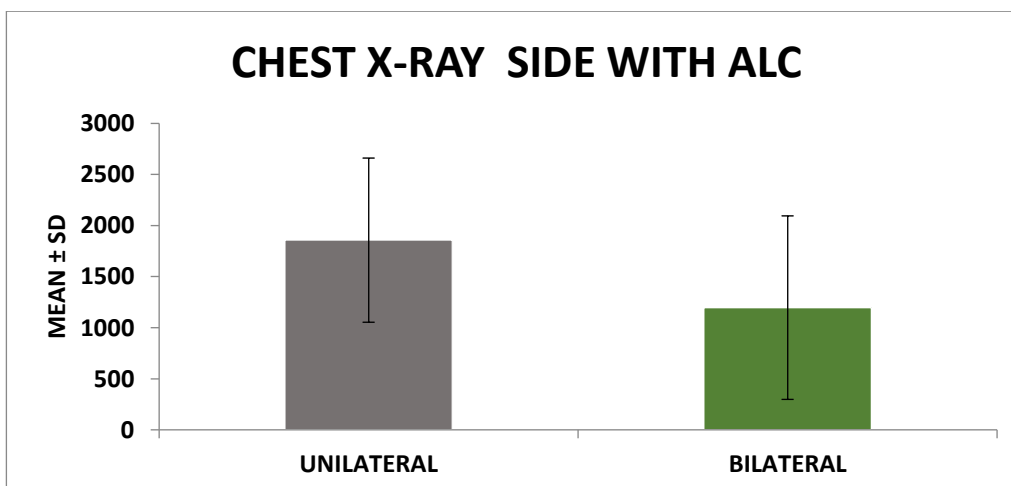


Figure 6) Comparison of CD4 count in patients with unilateral lung lesion and bilateral lung lesion.

Table 6)

	BMI CLASS	N	Mean Rank
ALC	UNDERWEIGHT	18	25.64
	NORMAL	33	40.65
	OVERWEIGHT	18	38.89
	OBESE	5	54.40
	Total	74	
CD4 COUNT	UNDERWEIGHT	18	27.58
	NORMAL	33	41.29
	OVERWEIGHT	18	37.67
	OBESE	5	47.60
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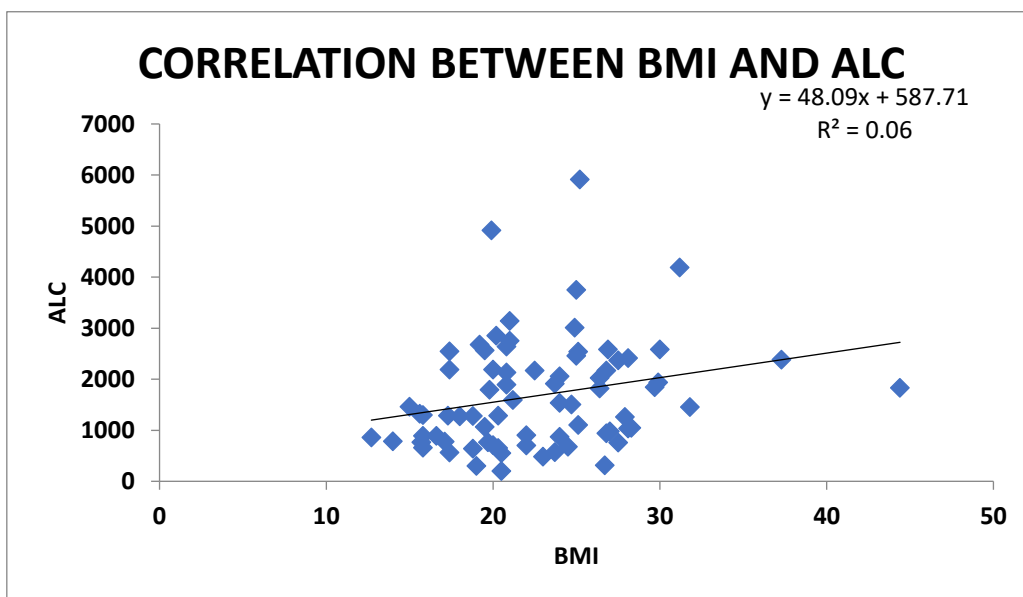


Figure 7)As BMI decreases there is decrease in ALC.