A Statistical Radiological Analysis in Patients with Sputum Smear Positive Pulmonary Tuberculosis

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ABSTRACT:

BACK GROUND:

Tuberculosis (TB) a multi-systemic disease with various presentations and manifestations; is due to infection with the acid fast bacillus mycobacterium. Disease occurs in only (10%) of infected individuals, it is associated with overcrowding and immune-compromised states

OBJECTIVE:

To identity the main findings in plain chest X-ray and CT-scan of the chest of pulmonary tuberculosis patients with sputum smear positive in relation to certain factors and clinical conditions including : gender, age , smoking , alcohol- consumption , co-morbid diseases e.g. diabetes mellitus and steroid medication for more than 4 weeks.

PATIENT AND METHOD:

Across sectional study of randomly collected (100) patients all were new cases of pulmonary tuberculosis disease with sputum smear positive, A plain chest radiography was done to all of them , and a randomly chosen (30) patients (out of the same sample of the study) were examined also by (high resolution CT-scan) of the chest to compare the radiological findings.The sample of patients collected consisted of (68)males and (32) females , aged between (12 -82) years.The study was done in the specialized chest and respiratory diseases center in Baghdad during the period from first of March 2012 ,to the end of August 2012.

RESULTS:

100patients with sputum smear positive – pulmonary tuberculosis disease were collected, 68 patients (68%) were males and 32 patients (32%) females. From our study97 patients(97%)of total number presented with positive radiological findings whether by plain chest X-ray and /or CT-scan of chest, And 3 patients(3%) of the sample studied were with normal both plain chest X-ray and CT-scan of chest

.The radiological findings of all of the patients studied were as: Infiltrative lesion48 patients(48%)Cavitary lesion(: 37%)Consolidation (32%)Pleural effusion (17%)Miliary shadowing(1%)Clear radiological was found that 28 patients (28%) had radiological abnormalities in the right side of the chest and 25 patients were with left sided radiographic abnormality, while bilateral chest radiological finding had been shown in44 patients (44%).

CONCLUSION:

The CT- scan of chest is more sensitive than plain chest X-ray for evaluation of abnormal or obscured radiological findings. There is no specific pattern for radiological finding in the chestthe direct sputum examination is remained the 'gold standard' for the diagnosis of pulmonary tuberculosis.

KEYWORD: sputum smear pulmonary tuberculosis.

INTRODUCTION:

Tuberculosis (TB), a multi-systemic disease with various presentations and manifestations. Disease occurs in only (10%) of infected individuals, it is associated with overcrowding and immune-compromised states [(1)].

Pulmonarytuberculosis is classified into either primaryor post primary pulmonary tuberculosis. Primary disease is characterized by pneumonia with or without mediastinal/hailer lymph adenopathy.Post-primary (reactivation) disease results in upper lobe fibro-Cavitarychanges [(2)] . Disseminated disease (Miliary –pattern)can involve lung, brain and visceral organs .By chest X-ray can show bilateral micro nodular pulmonary infiltration[(3)] .Chest X-ray finding in

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primary tuberculosis usually there is patchy or confluent segmental or lobar air space disease unilateral or bilateral , mediastinal/hailer lymph node enlargement , atelectasis from enlarged nodes and pleural effusion([4]).

Regarding the diagnostic accuracy of conventional chest X-ray in detecting enlarged lymph nodes thediagnosis is usuallyincorrect but spiral chest CT- scan with contrast used as the reference standard, where any lymph-node measuring at least 1 cm in any dimension was considered apositive finding, on the other hand indirect evidence of tuberculosislymph adenitis such as obstructive hyper aeration or atelectasis canbe seen on chest X-ray [5, 6].

Overall theaccuracy of chest X-rayinterpretation was disappointing, onethird of enlarged lymph nodes are not detected on chest X-ray and almost half of supposedly enlarged lymph nodes on chest X-ray are not confirmed by CT -scan of chest, so the lack of sensitivity may delay or even prevent diagnosis, while, the lack of specificity could lead to unnecessary further diagnostic test and /or unjustified treatment [7].

In post primary pulmonary TB;chest X-ray finding usually consists of patchy upper lobe or superior segment of lower lobe air space disease with cavitation, fibro nodular opacities with cicatrisation and broncho-pneumonia[8].

In disseminated disease the pleural effusion is common and the diagnosis is often first considered when the patient'schest radiograph being evaluated for respiratory symptoms.

If the patient has no complicating medical conditions that favorimmune-suppression, the chest radiograph may show the typical picture of upper and middle zones infiltration with cavitation.

It has been shown that longer the delay between the onset of symptoms and the diagnosis, the more likely is the finding of Cavitarydisease, in contrast immune-suppressed patients including those with HIV infection may have atypical finding on chest radiography e.g .lower zone infiltrates withoutcavity formation.[9,10,11]

However, in AIDs patients; any radiographic pattern from normal film or solitary pulmonary nodule to diffuse alveolar infiltrates may be seen. [12,13,14]

Endo bronchial tuberculosis

Regard reviewing unusual forms of tuberculosis which can be easily confuse clinicians ,it is useful in increasing their alertness for early diagnosis, which is essential for disease control and prevention of resulting complications.[17]Involvement of tracheo-bronchial tree by tuberculosis is not uncommon[18,19],spillage of infected material into the middle and lower lobes causes localized endo bronchial infection in some patients with pulmonary tuberculosis [20], which can be suspected in classic cases with suggestive X-ray findings.In the past two decades, several reports have been published concerning primary endobronchial tuberculosis with normal chest X-ray [17,18].Some of these cases can cause confusion which may result. In inappropriate treatment [20].

Patients with parenchymal pulmonary tuberculosis and endo- bronchialinvolvement usually present with atelectasis[21].

Atelectasis is usually lobar and right sided and can be as frequent as 10% - 30%inchildren[20], however it can also be observed in adults.Thesefindings maydevelop during tubercles pulmonary infectionoryears after its treatment [22].

We intend to study the relation between certain factors and clinical conditions including (gender,smoking, alcohol intake,co-existing diseases like diabetes mellitus and steroid use for more than 4 weeks) and the radiological findings of pulmonary tuberculosis in sputum smear positive patient.

To know the supportive role and the exact benefit of chest X-ray and CT-scan of the chest in detecting the type, site and side of tuberculosis-related-lesionand recognizing any hidden, or vague lesion associated with pulmonary tuberculosis, if any , and to be capable of improving the detection of this respiratory problem by using radiologic examination.

PATIENT AND METHOD:

Type of study: Across sectional study.

Setting:

A total of (100) new case of patients with ss+ve pulmonary TB was included in the study.

Our study was done on patients attending the specialized chest and respiratory diseases center inBaghdad. The study began at first of March 2012 and completed at the end of August2012.

Collection of data:

The study sample was collected from those patients who attending the specialized chest and respiratory diseases center of Baghdad for respiratory complaint, and who werediagnosed as a new cases of pulmonary tuberculosis by the specialist doctors in the center depending on the sputum smear positive.

Interviewing for every patient had been done according to questionnaire prepared for this purpose, which contain certain factors that could

be of importance to do the radiological study(chest X-ray and CT-scan) of chest, that could be related to pulmonary tuberculosis in patients with sputum smear positive, including; gender, smoking alcohol intake, diabetesmellitus and steroid using for more than 4 weeks .all patients were weighted.

All patients selected were sputum smear positive isolates of Mycobacterium; postero -anterior chest-X-ray view were done for all patients, followed by (HRCT-scan)of chest for only (30) patients out of the total number studied. These two types of radiographs were interpreted by recording the notes by two radiologists one of them is the radiology specialist of the specialized chest and respiratory diseases center, and the other is the chairman of the radiology –institute of Baghdad .

Statistical analysis:

The data collected were analyzed aspercentageaccording to certain factors and clinical conditions; (gender, age, smoking, alcohol intake, diabetes mellitus, and steroid use for more than 4 weeks)as well as type, site and side of pulmonarylesion by using the chi –square for testing the significance of clinical association.

The p-value of < 0.05 was considered to be statistically significant

RESULTS :

In this study (100) patients of SS+ ive pulmonary TB (SSP-PTB), all of them have had plain chest radiograph and (30) patients of them have had (HRCT-scan) of chest. The males constituted 68 patients (68%)and the females constituted 32 (32%).The age groups encountered range between 12 -82 years, the median age 47 years.The smokers patients were 35 patients (35 %)those with history of alcohol intake patients were 4(4%), 13 patients were the diabetic (13%), and 11 patients (11%) were on steroid-medication for more than 4 weeks.

Chest x-ray interpretation(Table 1)Were as follow: Infiltrative opacities:48 patients (48%) ,33 males ,15 females.consolidation 32 (32%), 15 males, at 17 females.

Cavitary lesion: 37 (37%), 25 male's 12 female's .pleural effusion: 17 patients (17%), 12 males and 5 females. Mediastinal lymph node enlargement: one male patient (1%) and two female patients (2%).Miliary shadowing :one male patient only (1%).Hillary lymph node enlargement :one male patient (1%), and two female patients (2%).clear chest X-ray :Total 3 (3%), all were of male gender.

Table 1:The classification of study sample according to type of chest X-ray lesion in relation to gender.

Type of lesion	Chest x-ray finding			
	Male	Female	Total	%
Infiltrative	33	15	48	48%
Consolidation	15	17	32	32%
Cavitation	25	12	37	37%
Pleural effusion	12	5	17	17%
Miliary shadowing	01	0	01	1%
Hilar-LAP	01	2	03	3%
Mediastinal-LAP	01	2	03	3%
Clear CXR	03	0	03	3%

It was found that 28 patients (28%) had chest X-ray abnormalities in the right side of the chest, and 25 patients(25%)the chest radiographic abnormality was on the left side of the chest , and bilateral chest X-ray lesions had been shown to be 44 patients (44 %)table (2).The single zone lesion were 19 patients (19 %) out of the total sample studied.

Lesion(s) in the upper -middle zones found in 30 patients(30%) and lesion(s)in the middle-lower zones found in 25 patients (25%), and 18 patients (18%) had their chest radiographic finding in the (upper- middle -lower) zones. while just 5 patients (5 %)were with upper-lower zones lesion(s) on chest radiographic examination .

In our series out of the 68 male patients there were 16 patients (23.52%) with right sided lesion on chest -radiograph , and 15 patients (23.50 %)were with left sided chest lesion , and 34 patients (54.4)% were with bilateral lesion(s), while out of the 32 female patient there were 12 patients (37.5 %) with Right sided lesion(s)and 10 patients (31.25%) with Lift sided lesion (s) . And 10 female patients with bilateral involvement .table (2).

Table 2:The relationship between patients factors and the side of lesion by chest-radiograph.

Patient-variables		Chest X-ray				
		Right n%	Left n %	Bilateral n%	x	p-value
Gender	Male	16(23.5)	15 (22.05)	34 (50)	1.32	0.52
	Female	12(37.5)	10(31.25)	10(31.25)		
Smoking	Yes	10(28.57)	6(17.15)	19(54.285)	1.82	0.40
	No	18	19	25		
Diabetes mellitus	Yes	05(38.4)	3(23.3)	5(38.4)	0.67	0.71
	No	23	22	39		
Alcohol-intake	Yes	01(25.0)	0	02(50)	2.13	0.35
	NO	27	25	42		
Steroid use	Yes	03(27.35)	2(18.9)	4(26.85)	0.86	0.65
	No	25	23	40		

NO=100 P-value < 0.05 (Note: 3male patients were with clear chest radiographs).

There is no statistically significant association between the patient's variable factors (gender, smoking, alcohol intake, diabetes mellitus and steroid medication for more than (4 weeks) and the side of the lesion.

There were 35smokers patients, 10 (28.5%)(with Rt sided chest lesion(s), 6 patients (17.157%)were with Lt sided chest lesion(s), and the remaining 19 patients (54.285%) were with bilateral lesions

[13] patients with diabetes mellitus, 5 patients (38.40%) out of them were with Rt side lesion(s) and 3 patients (23.30 %) were with Lt side lesion , and 5 patients (38.4 %)were with bilateral lesion (s). (patients with history of alcohol intake were 4 , one patient had Rt sided lesion(25%)and 2 patient (50%) were with bilateral lesion(s). While those 11 patients who were steroid user for more than 4 weeks, two patients out of them (18.2 %) were with Lt side lesion(s), 3 patients (27.35%)with Rt side-lesion (s), and 4 patients (36.85%) were bilaterally involved on chest radiographic examination (table 3).

The infiltrative chest X-ray finding had been occurred in 33 patients out of the 68 male's patients, and in 15 patients out of the female patients.In regard to patients variable factors the infiltrative lesion had been seen in 19 patients out of the 35 smokers, in 11 patient out of the 13 diabetic patients , 3 patients with alcohol intake out of 4 , and in 5 patients out of 11 patients with history of steroid medication for more than 4 weeks .

There is no significant association between patients variable factors (gender, smoking ,alcohol intake, diabetes mellitus and steroid medication)and the frequency of infiltrative – chest X-ray finding (table3).

Table 3: The relationship of chest X-ray infiltrative-lesion and patients variable factors.

Patient-variables		Infiltrative lesion on chest x-ray			
		Yes	No	x-value	p-value
Gender	Male	33	35	1.28	0.25
	Female	15	17		
Smoker	yes	19	16	0.84	0.41
	No	29	36		
Diabetic	Yes	11	2	3.23	0.072
	No	37	50		
Alcohol intake	Yes	3	1	1.25	0.26
	No	45	51		
Steroid use	Yes	5	6	0.505	0.477
	No	43	46		

P value < 0.05

The miliary pattern constituted of just one, smoker, diabetic male patient (1%), of young age (15-35 year) .There is no significant association between patients variable factors and the frequency of miliary shadowing lesion.

The cavitary chest X-ray finding had been observed in 25 male patients out of 68, and in 12 female patients out of 32.

In 22 smokers patients out of 35, 10 diabetics patients out of 13 , 3 patients with history of alcohol intake out of 4 , and in 7 out of those 11 patients who were steroid use for more than 4 weeks.There is statistically no significant association between patient's variable factors and frequency of the cavitary While the consolidation finding on chest X-ray had involved 15 males out of 68 males patients and 17 females out of 32 female patients.(table 4).

Table 4: The relationship between chest X-ray consolidation lesion and patients variable factors.

Patient variables		Consolidation finding on chest X-ray			
		Yes	No	x-value	p-value
Gender	male	15	53	1.45	0.275
	Female	17	15		
Smoking	Yes	22	13	0.76	0.32
	No	10	55		
Diabetics	yes	04	09	2.22	0.075
	No	28	59		

The consolidation lesion also affected 22 smokers out of 35 patients ,4 diabetic out of 13 , 2 patients with alcohol intake out of 4 patients , only 7 patients out of 11 with steroid medication having consolidation lesions on chest X-ray.

There is no statistically significant association between the patients variable factors (gender, age, smoking, alcohol- intake, diabetes mellitus, steroid use and frequency of the consolidation lesions(Table 4)

The distribution of lesion(s) - site was that in the upper-middle zones 21 males patients out of 68, and 9 females patients out of 32, also 10 smokers patients out of 35, 2 diabetics out of 11 patients, 1 patient with alcohol intake out of 4, and 3 patients with steroid using out of 11 patients with more than 4 weeks (table 5).

Table 5:The relationship between upper –middle zones chest X-ray lesion and patients variable factors.

Patient variables		Upper middle zones chest X-ray finding			
		Yes	No	x-value	p-value
Gender	male	21	47	3.975	0.13
	Female	09	23		
Smoker	Yes	10	25	2.57	0.277
	No	20	45		
Diabetics	yes	2	11	0.257	0.88
	No	28	59		
Alcohol intake	Yes	01	03	0.39	0.823
	No	29	67		
Steroid use	yes	03	08	0.806	0.668
	No	27	62		

The middle lower (zones) lesion was found to be 13 males patients and 12 female patents,5smokers patients 5diabetic patients , 2 patent with alcohol intake and 1 patient who was steroid abuser for more than 4week. While the lesions involving the upper - middle -lower zones at time of radiological examination were found in 12 male patients and6 female patients, 4 smoker, 3 diabetics, 1 with alcohol intake and5 patients with steroid medication for more than 4.There is no statistically significant association between the patients variable factors (gender , age , smoking, alcohol intake, diabetes disease and steroid using) and the distribution of lesion(s)in different zones of the lungs .(table 6)

Table 6: The relationship between upper-middle-lower zones chest X-ray lesion and patients variable factors.

Patient variables		Upper-middle-lower zones chest X-ray finding			
		Yes	No	x-value	p-value
Gender	male Female	12 06	56 26	0.989	0.0.32
Smoking	Yes No	04 14	31 51	2.66	0.102
Diabetics	Yes No	3 15	10 72	2.77	0.096
Alcohol-intake	Yes No	01 17	03 79	0.25	0.61
Steroid use	Yes No	05 13	06 76	1.73	0.677

No=100

Our study also had been found that the type of the lesion related to pulmonary TB disease is different in number in chest X-ray study than that seen by C T –scan of chest that is the cavitray lesion(s) constituted (30%) on chest x-each on CXR had become 4 haler LAP 13.3% and 5 mediastinal LAP 16.6% cases demonstrating on CT-scan of chest study .Also cases of bronchiectasis were 3 on chest X-ray 10% and were 5 cases 16.6% on CT-scan of ray while it formed 46.6 % of CT-scan of chest lesion(s), and (16.6%) pleural effusion on chest X-ray was found to be (33.3) %) added number seen on CT-scan , and 3cases with haler LAP and 3 cases with mediastinal LAP 10% for chest whether in infected or non-infected bronchiectasis) .(table12)The sample used in the comparison consisted of just (30) patients randomlyselected.(table7).

Table 7: Comparison between chest X-ray and CT-scan of chest according to type of the lesion

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Chest-x-ray finding location and side Location	Sample – studied	
	No.	%
Upper –zone	09	9%
Middle-zone	06	6%
Lower -zone	04	4%
Upper –middle zones	30	30%
Middle-lower zones	25	25%
Upper-middle-lower zones	18	18%
Upper -lower-zones	05	5%
Side: Right-lung lesion	28	28%
Left -long lesion	25	25%
Bilateral –lung lesion	44	44%

No=30

Table 8: Distribution of study sample according to location and side of chest x-ray lesion(s) No=100.

ype of lesion	Chest X-ray		CT-scan of chest	
	No	%	No	%
Infiltrative	11	36.6%	11	36.6%
Cavitation	9	30%	14	46.6%
Consolidation	12	40%	12	40%
Pleural effusion	5	16.6%	10	33.3%
Hilar LAP	3	10%	4	13.3%
Mediastinal LAP	3	10%	5	16.6%
Bronchiectasis	3	10%	5	16.6%
Miliary shadowing	1	3.3%	1	3.3%
Clear-chest-x-ray and/or CT-scan of chest	3	10%	3	10%

Note: 3cases were with clear CXR and /or CT-scan of chest.

Table 9: The relationship between upper-middle-lower zones chest X-ray lesion and patients variable factors.

Patient variables		Upper-middle-lower zones chest x-ray finding			
		Yes	No	X-value	p-value
Gender	male Female	12 06	56 26	0-989	0.0.32
Smoker :	Yes No	04 14	31 51	2.66	0.102
Diabetics :	yes No	3 15	10 72	2.77	0.096
Alcoholic :	Yes No	01 17	03 79	0.25	0.61
Steroid abuse :	yes No	05 13	6 76	1.73	0.677

No=100
P < 0.5

DISCUSSION :

Our study showed that single form or a lesion involving a zone and other zones are spared of lesions on chest X ray are very few finding on chest X ray.The single zone involvement was (19%) out of all the sample studied also kidd in 1886 was first who reported lower zone pulmonary tuberculosis ,and the incidence of lower zone pulmonary tuberculosis , showed great variation 0.6%-6.4%. .But mixed zones lesions or more than one zone involved is the prominent presentation on both plain CXR and/or CT -scan of chest. While the percentage of tuberculosis lesion(s)involving the upper-middle -lower zones as had been observed at time of examination by radiological study it was 12 males patients out of 68 (17.64%)and 6 female patients out of 32 (18.75%).

The percentage of zone involvement showed that higher figure when lower zone involved by lesion with other zones either upper or middle zones. kidd in 1886 was first who reported lower zone pulmonary tuberculosis ,and the incidence of lower zone pulmonary tuberculosis , showed great variation 0.6%-6.4%.

.It was found also that the lower zone pulmonary tuberculosis is more significant in female patients than in male patients, 37.5 %versus 19.117 % for the middle –lower – zones and 18.75% versus 17.645% in cases with the upper-middle-lowerZones related lesion(s), and it was more frequent in the age group 24 – 64 years (p value less than (0.05).

As show in table(8.9).

Similar results have been obtained from the study conducted in the infections and Tropical Diseases Research center of shahidsadoughi , university of medical science , Iran, this study published in 2006 and done on 217 patients with pulmonary tuberculosis diagnosed by chest X-ray and sputum examination by ziehl –neelsen method.This study showed that lower- zone pulmonary tuberculosis occurred in 43 patients

(19.8%) of pulmonary tuberculosis patients, in(12.8%) of the female patients and in (7.7 %) of the male patients.(34).

The increased incidence of lower zone pulmonary TB in female patient's has been explained by the fact that women have costal type of respiration resulting in better aeration and high oxygen tension of the lower lobe hence of tuberculosis (34).

The study also showed that lower zone pulmonary tuberculosis occurred more frequently in patients over the age of 60 year (41.9 %), in our study (65.6 %) were in the age group of (28-82 years), the high percentage in our study may be explained by the wider age group used in our study .

The other significant finding showed in our study was the finding of clear chest X-ray and /or clear CT-scan of chest, it was found in 3 out of the 100 patients with pulmonary tuberculosis (3 %), that the same 3 male patients seen on chest x-ray as having clear films were participated in the sample used in CT-scan of chest.

This may be explained by the immune suppression of steroid and alcohol intake .As noted by observers, it is important to remember that only (5 %) of patients with culture positive pulmonary tuberculosis had normal chest X-ray (35).

A study conducted by Dr .Mohamed Gulshan in Isfahan Islamic Republic of Iran , showed that 9 patients out of the 117 patients with pulmonary tuberculosis (7.69 %) were with clear chest X-ray finding ,the lower percentage in our study may be related to the geographical distribution of the disease, But higher percentage in Dr.Gulshan study is that bronchoscopy was used in his study which is more sensitive than chestX-ray and sputum smear in the diagnosis of pulmonary tuberculosis involving the tracheo-bronchial tree (endobronchnialTuberculosis).

While the results obtained on CT-scan of chest showed differences in regard to number of lesions such as cavities, pleural effusion, hilar/mediastinal lymph node enlargement and newly recognized cases of infected and non-infected bronchiectasis, so the figures recognized on chest X-ray changed on CT-scan of chest but remain in the same direction regarding the site and side.

CONCLUSION:

1- In majority of patients with sputum smear positive pulmonary tuberculosis disease; there is abnormal radiologic finding by plain chest radiograph and /or CT-scan of chest .Certain radiologic findings were more advanced in males than females, despite a similar period from the onset of symptoms to the time of diagnosis as infiltrative and cavitery tapes..

2- The CT-scan of chest is more sensitive than plain chest X-ray forevaluationof abnormal or obscured radiological findings.

3- There is no specific pattern for radiological finding in the chest

4- The direct sputum examination is remained the gold standard for the diagnosis of pulmonary tuberculosis .

RECOMMENDATION :

1- We have to carefully evaluate the close contact of new cases with pulmonary TB especially the males because they have more severe form of disease with more progression so early detection and treatment is important.

2- Patients with pulmonary TB and immuno-suppression due to associated systemic disease e.g .diabetes mellitus or drugs e.g .steroid medication , should have more specific imaging investigation like CT-scan to confirm or exclude hilar/mediastinal lymph node involvement because conventional chest X-ray lacks sensitivity and specificity in diagnosing hilar/mediastinal LAP .

3-patients with presumptive pulmonary TB and with clear chest radiography(both plain chest X-ray and CT-scan of chest) should undergo fibreopticbroncho-scopical examination , to confirm the diagnosis and to show if the patient has endobronchial tuberculosis.

Limitation of study:

The small number of sample may result in improper figure of the distribution of the lesion according to the lung zones, and so may falsely estimate the number of plain chest X-ray and CT-scan of the chest .

REFERENCES:

1. Mario C.,Richard J.J.Obrien.Tuberculosis.Harison Principles of internal medicine Thirteen edition 2500 ;953-972.
2. Nicki R.College,Brain R.Walker,Stuart H.Ralston,Davidson's Principles and practice of 21 st edition 2010;688-696.
3. Green B.,Frager SD, Active pulmonary tuberculosis in patients with AIDS, spectrum of radiographic findings. 1993;430-7.
4. Schmidek H.,Hardy H. pulmonary tuberculosis with normal chest radiograph. 1997;280-96.
5. Miller WT., JR. Tuberculosis in the normal host radiological finding.1993; 640-655.

6. Banes PF., VeregeanTD ,ChestRoetgenogram in pulmonary tuberculosis, new data on an old test. 1988;233-246.

7. Cohen R.,Muzaffar S.,Capellan J. The validity of classic symptoms and chest radiographic configuration in pediatric pulmonary tuberculosis,chest.1996;109: 420-433.

8. Wooding JH.,Vadiviere HM., Fried AM.UP date the radiographic features of pulmonary tuberculosis. 1986;146:497-506.

9. Long R., Macher B., Scalcini M. The chest in pulmonary tuberculosis patientssero positive for HIV type 1. Chest Journal. 1991;99:123-127.

10. Gawter EM.,Burkhardt KR. Correlation of the results of x-ray and sputum culture in tuberculosis prevalence survey, Tubercle. 1980; 61 :27-31.

11. Sokolove PE, Lee Bs, Krawczyk JA,Banos PT,et al. Implementation of an emergency department triage procedure for the detection and isolation of patients with active pulmonary tuberculosis. Ann Emerg. med. Sep. 1995; 26 (3):290-5.

12. Faser RS., Muller NI., Colman I. Diagnosis of diseases of the chest, 4th edition. Philadelphia WB Saunders.1999;(16):330-348.

13. CDC. Trends in tuberculosis-United states, 2008.MWWR Morb Mortal Wkly Rep. Mar 20 2009; 58(10):249-53.

14. Seaton A.,Seaton D.,Leich AG., Crofton and Douglas respiratory diseases, 5thEdition,Oxford. 2000;(12):950-61.

15. Brassard P.,Suissa S., Kezouh A., Ernst P. et al. Inhaled corticosteroids and risk of tuberculosis in patients with respiratory diseases. Am J. Respircrit care med. Oct 1 2010; (10):311-326.

16. Joshi S., Malik S., Kandoth PW.Diagnosis and therapeutic evaluation of bronchoscopy Indian for pediatric.1995;(15):720-39.

17. Wong KS., Wang CR., Haung YC. Tuberculosis pneumonia with endobronchial tuberculosis.Radiological cases of the month.1998;(14):920-934.

18. Lee JH., Chang HS. Bronchoscopic,Radiologic and pulmonary function evaluation of endobronchial tuberculosis.Respirology2000;(14):550-567.

19. Chang HS., Lee JH. Bronchoscopic assessment of the evaluation of endobronchial20tuberculosis .chest 2000;(6) 830-37.

20. Nakajima Y. ,Shiraishi Y. Surgical treatment and endobronchial stent placement for tuberculous trachea bronchial strictures . 1999;(18):1321-33.

21. Raman J., Mathew S., Garsha PS.Atelectactasis in children. Indian Journal pediatric. 1998; (11) :970-987.

22. Leung AN., Muller NL., Pineda PR. Primary tuberculosis in children, x-ray manifestation, Radiology. 1992;(10) 620-33.

23. Lasarus SG.,Nadel JA.,Mason RJ. Disorders of the intra thoracic airways, 3rd edition in murray. Text book of respiratory medicine.pheladelphia 2000;(15) 540-558.

24. Lam WK., MokCK.Endobronchial tuberculosis.Chest.2000;(2) 1100-1121.

25. Park AH., Fowler SS., ChallaPalli M. Suspected foreign body aspiration in children with endobronchial tuberculosis . Int. J. Pediatric otorhinolaryngeal.2000;(11):710-721.

26. Toyota E., Kobayashi M., Yoshizava A. Clinical investigation on endobronchialtuberculosis .1994;(10)561-574.

27. Takahashi N., Hovic T. Medical treatment for bronchial stenosis due to endobronchial tuberculosis.1999;(17)429-443.28-Nomori H., Suemasu K. Granulation stenosis. Surgical laproscopic endoscopic percutaneustechnique.2000;(10):1221-1234.

28. Park MJ., Wool S., Lee SJ., Kim DG,Mo Ek. Et al .Endobronchial tuberculosis with expectoration of tracheal cartilage, European respiratory Journal.2000;(7):120-7.

29. Long R., Maycher B., Dhar A. Pulmonary tuberculosis treated with directly observed therapy. Chest.1998;(9):670-87.

30. Swinhler GH.,Andronikon S. Diagnostic accuracy of chest radiography in detecting mediastinal lymphadenopathy . Arch Dis child .2005;(18):1218-26.

31. Starke J., Smith KC. Text book of pediatric infectious diseases 5th edition ,Philadelphia, WB,Saunder. 2004;632-40.

32. Andronikon S., Braner B.,Guplin J. Interobserver variability in the detection of pediatric radiology .2005;(2)730-42.

33. Landis JR., Koch GG.The m3asurment of observer agreement for categorical data.Biometrics.1997;(32):153-67.

34. Ayatollahi .Iran J .medical science June 2006; 31;79.

35. Marciiuk DD., Martin WT. Detection of pulmonary tuberculosis in patient with normal chest x-ray . Chest .1999;(10):1233-1245.