

Frequency of Atypical Radiological Pattern of Pulmonary Tuberculosis in Adults and Elderly (Dissertation Based Article)

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Abstract

Introduction: Tuberculosis is one of the oldest diseases and one third of the world's population is affected. Typical pattern (infiltration and or nodules with or without cavitations involving upper zone lung field) of pulmonary tuberculosis is the most common mode of radiological presentation in adults. There is a trend towards a relative increase in the unusual radiological presentations. This study was conducted to determine the frequency of atypical radiological trend of pulmonary tuberculosis in adults and elderly.

Subjects and Methods: The objective of the study was to determine frequency of atypical radiological pattern of pulmonary tuberculosis in adults and elderly. It was a descriptive (case series) study and was conducted in the Department of Pulmonology, Nishtar Hospital Multan. The study duration was six months from 24 May 2006 to 23 November 2006. 300 patients presenting with pulmonary tuberculosis were selected.

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History and clinical examination was done. Relevant investigations and x-ray chest were carried out. Lesions like infiltration with or without cavitation were localized in upper, middle and lower zones. Groups of patients with their x-ray findings in different zones were made and analyzed accordingly, data collected were entered in specific proforma.

Results: 205 (97.6%) adults and 85 (94.4%) elderly presented with cough while 205 (97.6%) adults and 75 (83.3%) elderly presented with fever. Out of 300 cases infiltration was found in 141 (46.19% vs 48.88%) young adult and elderly cases. There were 99 cases with nodule (35.71% vs 26.66%) and 60 cases had cavitation (18.09% vs 24.44%).

Conclusion: There is a trend towards a relative increase in the frequency of unusual radiological presentations which is more common in elderly.

Key Words: Pulmonary tuberculosis (PTB), Infiltration, nodule, cavitation.

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Introduction

Tuberculosis, one of the oldest diseases known to affect humans, is caused by bacteria belonging to the *Mycobacterium tuberculosis* (M tuberculosis) complex. The disease usually affects the lungs although in up to one third of cases other organs are involved. If properly treated, tuberculosis caused by drug susceptible strains is curable in virtually all cases. If untreated, the disease may be fatal within 5 years in more than half of cases. Transmission usually takes place through the airborne spread of droplet nuclei produced

by patients with infectious pulmonary tuberculosis (PTB).¹

Worldwide, tuberculosis occurs more often in men than women.² One third of the world's population is now infected with TB and it is the world's second deadliest infection, killing about 2 million people a year.³ Every year more than eight million people develop active tuberculosis.⁴ More than 90% of global TB cases and deaths occur in the developing world, where 75% of cases are in the most economical productive age group i.e. 15 – 54 years. Pakistan holds 8th position amongst 22 top countries of TB epidemics, having annual incidence rate of 175 / 100000.⁵

Pulmonary tuberculosis in adults is typically located in apices in lungs. Lower lung field tuberculosis although uncommon is a well recognized entity which still occurs in countries with low or high prevalence of tuberculosis.⁶ Classically pulmonary TB has three distinctive presentations – primary, reactivation, and miliary. However, pattern of TB in the elderly is so characteristic that it should be given a separate classification. Fever, productive cough, weight loss, night sweats and raised ESR are the most common findings in PTB patients.⁷⁻⁸

Typical pattern (infiltration and or nodules with or without cavitations involving upper zone right lung field) of pulmonary tuberculosis is the most common mode of radiological presentation in adults.⁹ There is a trend towards a relative increase in the frequency of unusual (atypical) radiological presentations in recent years which is more pronounced in elderly and diabetics.¹⁰⁻¹¹

Although a lot of work has been done worldwide on this aspect of the disease, limited work is available in this part of the world especially Pakistan. This is worthwhile to take this aspect of pulmonary TB (common communicable disease in our setting) because atypical location of lesion may result in misdiagnosis as lobar pneumonia, lung abscess or carcinoma of lung. This study was conducted to determine the frequency of atypical radiological trend of pulmonary tuberculosis in adults and elderly.

Objective

The objective of study was to;

- determine frequency of atypical radiological pattern of pulmonary tuberculosis in adults and elderly.

Operational Definitions

Pulmonary Tuberculosis

Patients presented with history of fever, weight loss, cough, haemoptysis, dyspnea and chest pain and confirmed by sputum for AFB.

Radiological Pattern

By *typical* radiological pattern, we mean infiltration and / or nodules with or without cavitations, involving upper zone while the pattern other than typical one is assumed as *atypical*.

Materials and Methods

Setting

Study was carried out in Department of Pulmonology, Nihstar Hospital Multan.

Duration of Study

The duration of study was six months starting from 24th May 2006 to 23rd November 2006.

Sample Size

300 patients with smear positive AFB were included in the study.

Sampling Technique

Non probability purposive sampling technique was used.

Sample Selection

Inclusion Criteria

- Adult with smear positive AFB age 21 – 60 years.
- Elderly with smear positive AFB age > 60 years.

Exclusion Criteria

- Patients with co-morbid conditions like diabetes mellitus, renal failure, chronic liver disease, heart failure and any malignancy.
- Extra-pulmonary tuberculosis.

Study Design

It was a descriptive case series.

Data Collection Procedure

Patients coming to OPD of chest diseases unit Nishtar hospital Multan were registered. All patients were registered with their consent. Age of patients was enquired. History including low grade fever of more than 3 weeks duration associated with night sweats, cough (with or without sputum), haemoptysis, dyspnea and chest pain was asked. Recording of pulse, blood pressure and respiratory rate were done.

Patients were looked for pallor, cyanosis, prominent neck veins and oedema feet. Examination of respiratory, cardiovascular, gastrointestinal and nervous systems were done. Investigations including full blood count, ESR, blood sugar, sputum smear for AFB and x-ray chest were carried out.

Lesions like infiltration with or without cavitation were localized in upper, middle and lower zones of x-ray chest P/A view. All x-ray findings were reviewed by radiologist. Groups of patients with their x-ray findings in upper, middle and lower zones were made. Groups of adult and elderly patients were analyzed whether they fall in upper zone (typical) or middle and lower zone (atypical) to calculate their frequency regarding lesions. Data collected were entered in specific proforma.

Data Analysis

All variables included in proforma were entered in computer programme SPSS (version 10.0). Descriptive statistics for numerical data i.e. age was calculated as mean \pm SD, while categorical data i.e. gender, infiltration, cavitation (upper, middle, lower zones of x-ray chest) were calculated as frequencies and percentages. X^2 test was used to know the significant difference, if any, in atypical presentation of radiological finding in two age groups i.e. adults and elderly.

Results

Present study was carried out on 300 young adults (age 21 – 60 years) and elderly (age > 60 years) cases with pulmonary tuberculosis. 210 patients belonged to young adult age group whereas 90 cases were elderly. The age range was 21 – 78 years with mean \pm SD 47.41 ± 15.22 years. The age distribution of the patients in different age groups is shown in Table 1.

Table 1: Age Distribution of Patients with Pulmonary Tuberculosis (n = 300).

Age (Years)	No. of Patients	Percentage
Young adult		
21 – 30	52	17.3
31 – 40	58	19.4
41 – 50	52	17.3
51 – 60	48	16.0
Total	210	70.0
Elderly		
61 and above	90	30.0

Age range = 21 – 78 years

Mean \pm SD = 47.41 ± 15.22 years

Key: Young adult = Patients of age 21 – 60 years

Elderly = Patients of age > 60 years

There were 234 (78.0%) males and 66 (22.0%) females as mentioned in Table 2.

Table 2: Sex Distribution of Patients with Pulmonary Tuberculosis (n = 300).

Sex	No. of Patients	
	Young Adult (n = 210)	Elderly (n = 90)
Male	144 (68.57)	66 (73.33)
Female	66 (31.43)	24 (26.67)

Key:

Young adult = Patients of age 21 – 60 years

Elderly = Patients of age > 60 years

Regarding the presenting symptoms, 205 cases (97.6%) came with cough in young adult group, while

85 cases (94.4%) in elderly group. Other major complaints were fever 205 (97.6%) cases in young adult group and 75 (83.3%) in elderly group, weight loss 157 (74.8%) cases in young adult group and 47 (52.2%) cases in elderly group, anorexia 153 (72.9%) cases in young adult group and 57 (63.3%) cases in elderly group respectively. Other complaints were spu-tum, haemoptysis, malaise and chest pain while 38 (18.1%) and 56 (62.2%) cases had non-specific symptoms in young adult and elderly age group respectively (Table 3).

Table 3: Presenting Symptoms in Patients with Pulmonary Tuberculosis.

Presenting Complaint	No. of Patients	
	Young Adult (n = 210)	Elderly (n = 90)
Cough	205 (97.6)	85 (94.4)
Sputum	138 (65.7)	66 (73.3)
Fever	205 (97.6)	75 (83.3)
Haemoptysis	96 (45.7)*	19 (21.1)
Weight loss	157 (74.8)*	47 (52.2)
Anorexia	153 (72.8)	57 (63.3)
Malaise	71 (33.8)	27 (30.0)
Chest pain	31 (14.8)	37 (41.1)*
Non specific	38 (18.1)	56 (62.2)*

*p <0.05 when compared between young adults and elderly
More than one symptom was present in most of the patients

Key:

Young adult = Patients of age 21 – 60 years

Elderly = Patients of age > 60 years

204 (68.0%) cases out of total (n = 300) had typical radiological pattern. Out of these, 146 were young adults that make 69.52% out of total 210 young adults, while 58 (64.44%) elderly out of total 90 had typical radiological pattern. The frequency of typical radiological pattern was significantly (p < 0.05) more in young adults when compared with elderly (Table 4).

Table 4: Radiological Pattern of Presentation of Patients with Pulmonary Tuberculosis (n = 300).

Radiological Pattern	No. of Patients		Total
	Young Adult (n = 210)	Elderly (n = 90)	
Typical	146 (69.52)*	58 (64.44)	204 (68.0)
Atypical	64 (30.48)	32 (35.56)*	96 (32.0)

*p < 0.05 when compared between young adults and elderly

Atypical radiological pattern was found in 96 (32.0%) cases out of total (n = 300). Out of these, 64 were young adults that make 30.48% out of total 210 young adults, while 32 (35.56%) elderly out of total 90 had atypical radiological pattern. The frequency of atypical radiological pattern was significantly (p < 0.05) more in elderly when compared with young adults (Table 4).

Regarding x-ray chest findings, 141 (47.00%) cases out of total (n = 300) had infiltration. Out of these, 97 were young adults that make 46.19% out of total 210 young adults, while 44 (48.88%) elderly out of total 90 had infiltration (Table 5).

Table 5: Distribution of Infiltration on X-Ray Chest in Relation to Age (n = 141).

Age Group	No. of Patients	Percentage
Young adult	97	46.19
Elderly	44	48.88

Key:

Young adult = Patients of age 21 – 60 years

Elderly = Patients of age > 60 years

Table 6: Distribution of Nodule on X-Ray Chest in Relation to Age (n = 99).

Age Group	No. of Patients	Percentage
Young adult	75	35.71
Elderly	24	26.66

Key:

Young adult = Patients of age 21 – 60 years

Elderly = Patients of age > 60 years

Table 7: Distribution of Cavitation on X-Ray Chest in Relation to Age (n = 60).

Age Group	No. of Patients	Percentage
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Young adult	38	18.09
Elderly	22	24.44

Key:

Young adult = Patients of age 21 – 60 years

Elderly = Patients of age > 60 years

99 (33.0%) cases out of total (n = 300) had nodule. Out of these, 75 were young adults that make 35.71% out of total 210 young adults, while 24 (26.66%) elderly out of total 90 had nodule (Table 6).

60 (20.0%) cases out of total (n = 300) had cavitation. Out of these, 38 were young adults that make 18.09% out of total 210 young adults, while 22(24.44%) elderly out of total 90 had cavitation (Table 7).

141 (47.0%) cases out of total (n = 300) had infiltration. Out of these, 68 young adults had infiltration in upper zone that make 32.38% out of total 210 young adults, while 26 (28.88%) elderly out of total 90 had infiltration in upper zone. 23 young adults had infiltration in middle zone that make 10.95% out of total 210 young adults, while 8 (8.88%) elderly out of total 90 had infiltration in middle zone. 6 young adults had infiltration in lower zone that make 2.85% out of total 210 young adults, while 10 (11.11%) elderly out of total 90 had infiltration in lower zone. The frequency of infiltration in upper zone was significantly (p < 0.05) more in young adults when compared with elderly. The frequency of infiltration in lower zone was significantly (p < 0.05) more in elderly when compared with young adults (Table 8).

Table 8: Distribution of Infiltration in Upper, Middle and Lower Zone of X-Ray Chest.

X-ray Finding	No. of Patients	
	Young Adult n = 210	Elderly n = 90
Upper zone	68 (32.38)*	26 (28.88)
Middle zone	23 (10.95)	8 (8.88)
Lower zone	6 (2.85)	10 (11.11)*

*p < 0.05 when compared between young adults and elderly

Key:

Young adult = Patients of age 21 – 60 years

Elderly = Patients of age > 60 years

99 (33.0%) cases out of total (n=300) had nodules. Out of these, 51 young adults had nodule in upper zone that make 24.28% out of total 210 young adults, while 17 (18.88%) elderly out of total 90 had nodule in upper zone. 17 young adults had nodule in middle zone that make 8.09% out of total 210 young adults, while 4 (4.44%) elderly out of total 90 had nodule in middle zone. 7 young adults had nodule in lower zone that make 3.33% out of total 210 young adults, while 3 (3.33%) elderly out of total 90 had nodule in lower zone. The frequency of nodules in upper and middle zones was significantly (p < 0.05) more in young adults when compared with elderly (Table 9).

Table 9: Distribution Nodule in Upper, Middle and Lower Zone of X-Ray Chest.

X-ray Finding	No. of Patients	
	Young Adult n = 210	Elderly n = 90
Upper zone	51 (24.28)*	17 (18.88)
Middle zone	17 (8.09)*	4 (4.44)
Lower zone	7 (3.33)	3 (3.33)

*p < 0.05 when compared between young adults and elderly

Key:

Young adult = Patients of age 21 – 60 years

Elderly = Patients of age > 60 years

60 (20.0%) cases out of total (n = 300) had cavitation. Out of these, 27 young adults had cavitation in upper zone that make 12.85% out of total 210 young adults, while 15 (16.66%) elderly out of total 90 had cavitation in upper zone. 8 young adults had cavitation in middle zone that make 3.80% out of total 210 young adults, while 4 (4.44%) elderly out of total 90 had cavitation in middle zone. 3 young adults had cavitation in lower zone that make 1.42% out of total 210 young adults, while 3 (3.33%) elderly out of total 90 had cavitation in lower zone. The frequency of cavitation in upper zone was significantly (p < 0.05) more in elderly when compared with young adults (Table 10).

Table 10: Distribution of Cavitation in Upper, Middle and Lower Zone of X-Ray Chest

X-ray Finding	No. of Patients	
	Young Adult n = 210	Elderly n = 90
Upper zone	27 (12.85)	15 (16.66)*
Middle zone	8 (3.80)	4 (4.44)
Lower zone	3 (1.42)	3 (3.33)

*p < 0.05 when compared between young adults and elderly
Key:

Young adult = Patients of age 21 – 60 years

Elderly = Patients of age > 60 years

Discussion

The roentgenographic picture of pulmonary tuberculosis has undergone some changes for the past decades. The conventional approach to the diagnosis of PTB is reasonably accurate and efficient enough for the majority of patients.¹³ The incidence of lower lung filed tuberculosis defined as “tuberculous disease found below an imaginary line traced across the hilum on a standard postero-anterior film, has recently gathered some interest.

The chest radiograph may be particularly helpful in diagnosing pulmonary TB because in a significant proportion of patients symptoms and signs are either nonspecific or absent.¹⁴

Chest radiographs are an important tool for the diagnosis and follow-up. Yet the radiographic findings can vary significantly, ranging from the so – called usual to unusual patterns.¹⁵ Due to an altered immunological response in certain groups, such as immunocompromised and elderly patients, an atypical radioclinical pattern may occur.¹²

Major presenting symptoms in present study in young adult and elderly age groups were observed and similar symptoms were reported by Rizvi and associates in their study conducted at Karachi in which fever was 98.3% vs 83.8%, haemoptysis 46.3% vs 21.6, weight loss 74.5% vs 52.4, dyspnea 23.9% vs 73.0%, chest pain 14.9% vs 40.5% and non specific 17.9% vs 62.2% in adults and elderly group respectively.⁸ So non specific symptoms were more common in elderly patients. In another study by Martin and Lazarus similar symptoms were observed in young adult and elderly patients.¹⁶

There were 204 patients (68.0%) with typical pattern and 96 patients (32.0%) with atypical pattern in present study. Rao and Sadiq¹⁷ observed that 58.0%

patients showed the typical pattern (infiltration and/or nodules with or without cavitations, involving upper zone), while 42.0% showed the atypical pattern (pattern other than typical one) in their study. So typical pattern of pulmonary tuberculosis still seems to be the common mode of presentation in adults but there is a trend toward increase in atypical pattern.

In present study out of 300 patients, infiltration was observed in 141 (47.0%) patients i.e. 97 (46.19%) young adult and 44 (48.88%) elderly patients. Out of 141 patients with infiltration, 68 (32.38%) young adult and 26 (28.88%) elderly patients had infiltration in upper zone. Rizvi and associates have also reported that upper zone infiltration was more frequent in young adult age group in their study.⁸

Out of 141 patients with infiltration, middle and lower zone infiltration was observed in (10.95% vs 8.88%) and (2.85% vs 11.11%) young adult and elderly age groups respectively. Rizvi and associates have reported that lower zone infiltration was more frequent in elderly group patients (37.8% vs 3%).⁸

In present study out of 300 patients, nodule was observed in 99 (33.0%) patients i.e. 75 (35.71%) young adult and 24 (26.66%) elderly patients. Out of which 24.28% young adult and 18.88% elderly patients had nodule in upper zone. Middle zone nodule was observed in (8.09% vs 4.44%) and lower zone (3.33% vs 3.33%) in young adult and elderly patients respectively.

Deivanagam et al have reported upper zone nodule 23.69%, and mid and lower zones nodule 26.53%.¹⁸

In present study out of 300 patients, cavitation was observed in 60 (20.0%) patients i.e. 38 (18.09%) young adult and 22 (24.44%) elderly patients. Out of which 12.85% young adult and 16.66% elderly patients had cavitation in upper zone. Middle zone cavitation was observed in (3.80% vs 4.44%) and lower zone (1.42% vs 3.33%) in young adult and elderly patients respectively.

Deivanagam et al have reported upper zone cavitation 17.21%, and mid and lower zones nodule 7.6%.¹⁸

In another study Navio P and associates have reported infiltrate in 12.3%, nodule in 20.6% and cavitation in 52.5% patients of PTB.¹⁹

Adult PTB still presents with the classical pattern of reactivation disease. Although not statistically significant, there is a trend towards a relative increase

in the frequency of unusual presentations in recent years, which is most pronounced in the elderly.¹⁶

Conclusions

Our study revealed that elderly patients with PTB were more likely to present with chest pain and non specific symptoms. Similarly radiographic appearance was atypical (lower zone infiltration and nodule with or without cavitation) were more common in this age group.

Young adult patients presented with classical symptoms of TB, and also had greater frequency of upper zone infiltration on chest radiograph.

There is a trend towards a relative increase in the frequency of unusual radiological presentations which is more common in elderly.

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