



A Prospective Comparative Study among Adult and Geriatric Smear Positive Pulmonary Tuberculosis Patients in a Tertiary Care Hospital of Dehradun, Uttarakhand

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Financial Support: Funded

Conflict of Interest: None declared

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How to cite this article:

Pandita AK, Raina D, Sardana D. A Prospective Comparative Study among Adult and Geriatric Smear Positive Pulmonary Tuberculosis Patients in a Tertiary Care Hospital of Dehradun, Uttarakhand. Natl J Community Med 2017; 8(7):390-395.

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Date of Submission: 19-05-17

Date of Acceptance: 18-07-17

Date of Publication: 31-07-17

ABSTRACT

Background: Tuberculosis has remained a public health problem in India since long and is increasingly becoming more common in older age group.

Aim: This study aimed to compare the clinical features, predisposing factors and imaging findings of pulmonary TB in the elderly and in young adults, and to determine if any difference exists between the two age groups.

Materials and Methods: A total of 38 patients were in the elderly group while 130 patients made the young adult group. A prospective case series study was designed to see similarity/ dissimilarity between both groups of patients.

Results: Mean age of young adult and elderly patients was 46 ± 3.5 years and 64.7 ± 2.4 years respectively. Weight loss (65.8%), Anorexia (73.7%), Chest pain (36.8%) and Dyspnoea (52.6%) were seen mostly in the elderly age group however symptoms like cough (88.5%), fever (90%), night sweats (59.2%) and haemoptysis (34.6%) were common in the adult age groups. Bilateral involvement (60.5% vs. 37.7%), far advanced disease (28.9% vs. 20.8%) and a lower zone involvement (31.6% vs. 10%) were more frequently found in elderly patients as compared to young adult patients.

Conclusions: With the rising elderly population and non specific presentation of symptoms of TB in this group specific strategies are needed to quickly address TB management in the elderly.

Key words: Pulmonary tuberculosis, Young adults, Elderly patients.

INTRODUCTION

Pulmonary tuberculosis represents an important worldwide public health problem. Due to increase in life expectancy, the population and absolute number of elderly have increased all over the world. India is the second largest country in the world with 72 million elderly people (Above 60 years of age) next only to China. This emphasizes the extent and importance of this group of population in India in near future. Tuberculosis has remained a public health problem in India since

long. It is increasingly becoming more common in older age group¹ Globally, the frequency of tuberculosis among elderly persons is about three times than that observed in non-elderly². In persons aged 60 years and above the accentuated risk is being driven by immunosuppression, malnutrition, poverty, reduced access to health services, and comorbidities like diabetes mellitus³. Also, with age-related physiological, psychological, physical disability and social changes compounded by chronic degenerative diseases, TB in elderly (≥ 60 years) individuals is likely to follow a non-classical course⁴.

The loss of cellular immune reactivity (i.e., negative tuberculin skin test) to *Mycobacterium tuberculosis* occurs in some elderly population who were previously infected with this organism, thereby rendering them vulnerable to re-infection. Also, the elderly are at a greater risk for reactivation of latent TB. In elderly, approximately three-quarters of all TB cases occur in the respiratory tract. Although, the mortality rate of TB in elderly is higher, TB is a preventable cause of death in elderly patients⁵.

Moreover, tuberculosis treatment in elderly individuals has been found to be complicated by treatment for co-morbid diseases leading to a consequent increase in adverse drug effects, mortality, treatment default and increased rates of retreatment and drug resistance^{6,7}. Therefore an active approach to diagnose, treat and prevent TB in the elderly is indicated.⁵ With the current demographic transition and increasing life expectancy in low and middle income countries, the proportion of elderly persons is increasing, and the incidence of TB among them is expected to increase further⁸. Thus, failure of early identification and management of TB in the elderly can present major challenges for TB control programmes as affected elderly patients may have increased morbidity and mortality and they can become an important source of infection; perpetuating the chain of transmission in the community^{9,10}.

There is paucity of medical literature on this subject which shows poor attention to geriatric pulmonary tuberculosis in our country. Sometimes elderly tuberculosis may mimic pediatric tuberculosis and pose problem in diagnosis. Therefore this study was planned to compare the clinico-radiological presentation of pulmonary tuberculosis in the young adults and elderly age group.

MATERIAL AND METHODS

The study included all elderly TB patients (≥ 60 years) and non-elderly adult TB patients (18–59) years attending the OPD clinics of the Dept. of Pulmonary Medicine of Shri Mahant Indiresch Hospital, Shri Guru Ram Rai Institute of Medical and Health Sciences, Dehradun. The study was conducted over a period of 6 months from July 2016 to December 2016. A total of 168 cases of smear positive Tuberculosis were recruited in the study out of which 130 were adults and 38 were geriatric patients. A prospective case series study was designed to see similarity/ dissimilarity between both groups of patients.

Inclusion criteria: Only smear positive newly diagnosed pulmonary tuberculosis patients and pulmo-

nary tuberculosis associated with extra pulmonary tuberculosis were included in the study.

Exclusion criteria: All other forms of extra pulmonary tuberculosis, treatment failure, relapse, drug resistant tuberculosis and HIV seropositive patients were excluded.

A structured patient pro forma was prepared. Patients were evaluated according to this predetermined protocol and history was taken regarding various socio-demographic factors as name of the patient, age, sex, occupation, residence, household condition and hygiene behaviour and previous exposure. Relevant medical history was taken regarding daily habits of the patients as alcoholism and smoking, socio-economic factors such as income of the individual, income of the head of the household, literacy and number of people per household, clinical/epidemiological factors as delayed treatment onset, history of contact with TB and previous treatment for TB, presentation of the disease, clinical profile and tests results, access to health care facilities (number and location of the health care facilities at which treatment was sought prior to diagnosis, as well as coverage provided by the Family Health Programme) and associated co morbid conditions.

Patient Evaluation: Patients were evaluated after obtaining written informed consent from them. All patients having symptoms suggestive of pulmonary tuberculosis were subjected to sputum smear for AFB examination, Mantoux test, X ray chest PA view and hematological investigations.

Sputum Smear Examination: According to the revised guidelines of the National Tuberculosis Control Programme (India), two sputa samples (spot and morning) were collected from the patient. When the patient approached the center to collect the container, spot specimen was collected. When the Patient expectorated the second sample on the next morning in the given container and submitted it to the laboratory it comprised the early morning sample¹¹. In patients without spontaneous sputum production, sputum induction was induced using hypertonic saline.

Acid fast staining of the smear was done using Ziehl-Neelsen method of staining¹¹. If Pink colored, slightly curved bacilli in singles or clumps, with occasional branching and beaded appearance were seen against a blue background consisting of many pus cells and few epithelial cells then the given smear was reported as positive for acid fast bacilli.

Hundred fields were observed in each smear before giving a negative report. If acid fast bacilli were seen, they were counted and the smear was graded according to RNTCP guidelines.

According to the RNTCP, sputum sample was graded in the following way¹¹:

- >10 AFB/oil immersion field in at least 20 fields: 3+
- 1-10 AFB/oil immersion field in at least 50 fields: 2+
- 10-99 AFB/100 oil immersion fields: 1+
- 1-9 AFB/100 oil immersion fields: To record exact number

Radiological Evaluation: Radiologists, aware of the diagnosis but not clinical history, reviewed the initial radiographs.

The tubercular lesions were classified according to the site of lesion (unilateral, bilateral) and extent of lesion. Extent of lesion again divided in three, Minimal lesion (Disease with a combined area of less than that of the right upper lobe); Moderately advanced (Disease with a combined area of less than that of the right lung but more than that of the right upper lobe); and Far advanced (Disease with a combined area of more than that of the right lung). The upper and lower lung fields were defined as the lung above and below the hilar level respectively. Cavitation was considered to be present only when its diameter was more than 2 centimeters.

RESULTS

The demographic profile of both groups is summarized in Table 1. The younger patients ranged from 18 to 59 years of age and the elderly patients ranged from 60 to 82 years. Male predominance was seen in both the groups. Majority of patients in both groups belonged to urban and lower class.

The prevalence of co-morbidities such as diabetes, COPD, CKD and peptic ulcers was higher in elderly patients while Psychiatric disorders were more frequently found in young adult patients (Table 2). The proportions of patients with different symptoms are compared in Table 3. Weight loss, Anorexia, Chest pain and Dyspnoea were seen mostly in the elderly age group however symptoms like cough, fever, night sweats and hemoptysis were common in the young adult age groups.

The radiological features of both groups are summarized in Table 4. Bilateral involvement, Moderate and far advanced disease and a lower zone involvement were more frequently found in elderly patients as compared to young adult patients. Radiographic image of cavitations were more frequently found in young patients.

Table 5 shows the comparison of bacillary load between the two groups. It was observed that the high bacillary load (3+) was found to be more in elderly than young adults. Within the elderly group 63.1% reported 3+ smear positivity.

Associated extra pulmonary involvement was more common in the elderly group as compared to young adults amongst the patients of pulmonary tuberculosis (Table 6). The laboratory data in the study concluded that anaemia was present in both the younger aged and the elderly groups however, the elderly age group was relatively more anaemic than the younger age group. leukocytosis was present in the elderly group (63.2%). Thrombocytosis was also on the higher side in elderly (47.4 %) (Table 7).

Table 1: Population characteristics of the young adult and the Geriatric pulmonary tuberculosis patients

Characteristics	Adults (n=130)	Geriatric (n=38)
Age (mean)±SD	46±3.5	64.7±2.4
Gender		
Male	90 (69.2)	29 (76.3)
Female	40 (30.8)	9 (23.7)
Residence		
Rural	41 (31.5)	8 (21.1)
Urban	89 (68.5)	30 (78.9)
Religion		
Hindu	104 (80)	26 (68.4)
Others	26 (20)	12 (31.6)
Socio-economic		
Upper class	18 (13.8)	7 (18.4)
Middle class	48 (36.9)	9 (23.7)
Lower class	64 (49.3)	22 (57.9)

Figure in parenthesis indicate percentage

Table 2: Co-morbidities in the young adult and the Geriatric pulmonary tuberculosis patients

Co-morbidities	Adults (n=130)	Geriatric (n=38)	P value
Diabetes mellitus	26 (20)	17 (44.7)	0.004*
Hypertension	30 (23)	14 (36.8)	0.13
COPD	14 (10.7)	15 (39.5)	0.0001*
CKD	15 (11.5)	13 (34.2)	0.002*
Pneumonia	10 (7.7)	8 (21)	0.04*
Peptic ulcer	14 (10.7)	9 (23.7)	0.07
Psychiatric disorders	23 (17.7)	5 (13.2)	0.68
Malignancy	7 (5.4)	4 (10.5)	0.45

*P<0.05; Figure in parenthesis indicate percentage

Table 3: Symptomatology of pulmonary tuberculosis in young adult and elderly patients

Symptoms	Adults (n=130)	Geriatric (n=38)	P value
Sputum/ Cough	115 (88.5)	29 (76.3)	0.10
Fever	117 (90)	23 (60.5)	0.0001*
Night sweats	77 (59.2)	8 (21)	0.0001*
Weight loss	71 (54.6)	25 (65.8)	0.29
Anorexia	76 (58.5)	28 (73.7)	0.13
Chest pain	32 (24.6)	14 (36.8)	0.20
Dyspnoea	22 (16.9)	20 (52.6)	0.0001*
Haemoptysis	45 (34.6)	7 (18.4)	0.08

*P<0.05; Figure in parenthesis indicate percentage

Table 4: Radiological Profile of the young and elderly pulmonary tuberculosis patients

Radiological Profile	Adults (n=130)	Geriatric (n=38)	P value
Site of lesion			
Unilateral	81 (62.3)	15 (39.5)	0.02*
Bilateral	49 (37.7)	23 (60.5)	
Extent of lesion			
Minimal	49 (37.7)	9 (23.7)	0.25
Moderate	54 (41.5)	18 (47.4)	
Far advance	27 (20.8)	11 (28.9)	
Involvement of zone			
Upper zone	75 (57.7)	16 (42.1)	0.004*
Lower zone	13 (10)	12 (31.6)	
Multiple zone	42 (32.3)	10 (26.3)	
Cavitary lesion			
Yes	71 (54.6)	12 (31.6)	0.02*
No	59 (45.4)	26 (68.4)	

*P<0.05; Figure in parenthesis indicate percentage

Table 5: Microbiological Lab Investigations of the young and elderly pulmonary tuberculosis patients

RNTCP Grading	Adults (n=130)	Geriatric (n=38)
Scanty	7 (5.4)	2 (5.2)
+1	28 (21.5)	7 (18.4)
+2	27 (20.7)	5 (13.1)
+3	68 (52.3)	24 (63.1)

Figure in parenthesis indicate percentage

Table 6: Extra-pulmonary tuberculosis associated with pulmonary tuberculosis

Extra-pulmonary Tuberculosis	Adults (n=130)	Geriatric (n=38)	P Value
T.B Laryngitis	6 (4.6)	3 (7.9)	0.7
Pleural effusion	13 (10)	10 (26.3)	0.02*
Disseminated/miliary	4 (3.1)	7 (18.4)	0.002*
Hydropneumothorax	12 (9.2)	2 (5.3)	0.65
Total	35 (27)	22 (57.9)	0.0008*

*P<0.05; Figure in parenthesis indicate percentage

Table 7: Haematological Lab Investigations of the young and elderly pulmonary tuberculosis patients

Lab Investigations	Adults (n=130)	Geriatric (n=38)	P value
Haemoglobin			
Anaemia(<10gm%)	30 (23.1)	15 (39.5)	0.07
Normal	100 (76.9)	23 (60.5)	
TLC			
Leucocytosis (>11000/mm ³)	55 (42.3)	24 (63.2)	0.03*
Normal	75 (57.7)	14 (36.8)	
Platelet count			
Thrombocytosis	51 (39.3)	18 (47.4)	0.47
Normal	79 (60.7)	20 (52.6)	

*P<0.05; Figure in parenthesis indicate percentage

DISCUSSION

Despite extensive tuberculosis control efforts in the

past by WHO and local health departments, the tuberculosis epidemic continues to ravage the developing world; affecting all susceptible individuals including aging adults. Several factors such as increase in the elderly population, immunocompromised host, patients on steroids, anti-cancer drugs and immunosuppressive drugs and reactivation of dormant infection have contributed to this increasing proportion of TB in elderly¹.

Co-morbid diseases, malnutrition and the biological changes that are associated with aging can disrupt protective barriers, impair microbial clearance mechanisms, and contribute to the expected age-related decrease in cellular immune responses to microbes such as M. tuberculosis. These factors may lead to delay in the healing process and increase morbidity and mortality in elderly TB patients⁵.

In our study, in both groups males were predominantly affected similar to the observations of Morris, Tripathy and Kar in their study reported 78% of their patients to be males^{12,13}. Meta-analysis of 12 studies done by Carlos Perez-Guzman showed male preponderance¹⁴. Similar observations were reported by Tan KK et al¹⁵. One possible explanation for this male predominance may be that in most countries young men usually have more social and labour activities than women, thus favouring the transmission of the disease¹.

In our study, elderly tuberculosis patients had significantly higher occurrence of co-morbidities like hypertension, COPD, malignancy and diabetes. These results correspond to those of Alvarez et al, Umeki et al, Vanden Brande^{16,17,18}. The exact relationship between these disorders and disease produced by M. tuberculosis is not fully understood because none of the studies included control non-tubercular group.

Our data suggest that symptoms like cough, hemoptysis, febrile sense and night sweats occurred significantly more in young adults; whereas anorexia, weight loss, chest pain and dyspnoea were more frequent in elderly patients. The above results are in agreement with those of others who found more classical symptoms in young adults^{16,12,19}. Umeki and Vanden Brande et al also reported similar results, though they found that hemoptysis occurred equally in both groups^{17,18}.

Since febrile sense and elevated body temperature were less frequently recorded in elderly patients than in young, this can be explained by the decreased pyrogenic response with aging and reduced perception of fever in elderly. The lower frequency of sweating in older patients is likely related to the lower frequency of fever in them. The elderly TB patients commonly presented with non

specific general symptoms such as anorexia, weight loss, dyspnoea and chest pain because many elderly patients visit physicians after the disease had progressed to advanced stage due to lower awareness of the disease among them, and poor socioeconomic status in our society. These results were in agreement with those of Chan C.H and Liaw Y.S^{20,21}. In our study, the higher frequency of hemoptysis in young patients was probably related to the higher frequency of lung cavitations in them. This was in agreement with other studies by Mori T and Hoheisel G^{22,23}. Korzeniewska-Kosela et al., Umeki, and Lee et al. recorded that, no difference between elderly and young patients as regards cough, sputum production and hemoptysis, inconsistent with our study which recorded higher frequency of presentation of elderly by non specific manifestations which could be explained by earlier pulmonary TB detection by mass survey in the former studies^{24,17,19}.

As for roentgenographic abnormality, in the present study, a higher involvement of lower lung field, more advanced lesion and less frequent cavitations were observed in the elderly patients than young adults. There had been much debate concerning the atypical radiographic findings of TB in the elderly. Some have reported no major differences while others have reported a higher involvement of the middle and lower lung fields in the elderly. Our findings are consistent with those of Perez and chan et al in this respect^{14,20}. It has been suggested that the higher frequency of lower lung disease and less cavity formation in the elderly is due to immunologic abnormalities, higher frequency of primary tuberculosis and higher VA/VQ ratio and PAO₂ in the lower lobe in elderly people. Therefore age induced changes should favour multiplication of mycobacterium tuberculosis in lower lung zone¹.

High bacillary load was reported in 63.1% elderly as compared to 52.3% adults possibly making them more infectious that warrants early diagnosis and management. Tan et al also reported that the elderly had significantly more severe disease and high bacteriological burden compared with age group 15-45 years¹⁵. This could be attributed to the associated comorbid conditions in the elderly and decreased immune responses.

Among patients of pulmonary tuberculosis, associated extra pulmonary involvement was more common in elderly group as compared to young adult (57.9% vs. 27%). Our results correspond to those of Zamarron et al²⁵

On investigation the incidence of anemia was significantly more in the elderly. This finding could be explained by the fact that older persons suffer from malnutrition much more frequently than

younger people. Our findings are consistent with those of Alvarez and Morris et al^{16,12}. TB has also been associated with leucocytosis. *Mycobacterium tuberculosis* infection is associated with thrombocytosis. This effect might be related to increased levels of interleukin and may lead to a hypercoagulable state and deep vein thrombosis²⁶.

In conclusion, this study shows that elderly pulmonary tuberculosis patients contribute substantially to the incidence of TB and are more likely to present with non-specific symptoms and atypical radiographic findings i.e the clinical features of TB in the elderly patients are less prominent posing diagnostic difficulties. A higher frequency of comorbidities and higher extra pulmonary involvement was found in elderly TB patients. Moreover atypical clinico-radiological manifestations of tuberculosis in older persons can further cause overlap of symptoms resulting in a delay in diagnosis and initiation of treatment. This can unfortunately lead to higher rates of morbidity and mortality from this treatable infection in this population. So maintenance of a high index of suspicion for tuberculosis in this vulnerable population is undoubtedly justifiable.

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