Journal of Tropical Diseases
ISSN: 2329-891X

Ghweil et al., J Trop Dis 2018, 6:2
DOI: 10.4172/2329-891X.1000262

Research Article Open Access

Pattern of Tuberculosis in Elderly Patients in Egypt

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Received date: October 31, 2017; **Accepted date:** May 2, 2018; **Published date:** May 09, 2018

Abstract

Background and study aim: Tuberculosis (TB) is one of the most prevalent and grave of all humanoid contagious diseases and is still a major infectious disease worldwide. The geriatric population in developed countries represents a big reservoir of tuberculosis infection across all racial and sex subsets. We aim in this study to assess the pattern of TB in elderly patients in Qena governorate in Egypt.

Patients and methods: All patients aged 50 years and above who were diagnosed with TB have been included in the study. The patients were evaluated regarding the incidence rate: for new cases, and relapse cases (pulmonary and extra pulmonary).

Results: The mean age of included patients was 41.18 years and 51.3% of the studied patients were male. Regarding residence we found 54.7% of patients live in rural areas and 45.3% in urban. 82.9% of the patients were tuberculin positive. As regard chest x-ray finding we found: normal in 17.1% of patients, 17.1% bilateral, 25.6% right upper lobe 16.2% whole right lung, 10.3% left upper lobe, 6% left lower lobe, 3.4% right lower lobe, 2.6% pleural effusion and 1.7% whole left lung. In the present study we found that 81.2% of patients had pulmonary TB and 18.8% had extra pulmonary TB.

Conclusion: The study documents important variances in clinical and radiological findings of pulmonary TB in geriatric patients. Sputum analysis for AFB remains a significant, easy and cheap method for diagnosis, but might not be continuously supportive in early diagnosis.

Keywords Tuberculosis; Humanoid contagious diseases; Pulmonary TB

Introduction

Tuberculosis is an infectious disease which is caused by the bacterium, *Mycobacterium tuberculosis* and is transmitted from one person to another via airborne droplets (e.g. when an infected person coughs or sneezes). The primary site of Tuberculosis is the lungs (causing pulmonary tuberculosis), but it can also affect other organs, e.g. central nervous, lymphatic, and circulatory systems among others leading to in extrapulmonary tuberculosis. When a person first becomes infected, the tuberculosis bacteria generally lay dormant in the body and the person will not manifest any symptoms (Latent Tuberculosis). Persons with Latent Tuberculosis Infection are not infectious. In persons who are immunocompromised (e.g. elderly or those who are human immunodeficiency virus (HIV) positive patients), the rate of progressing to active tuberculosis disease will be higher than in healthy individuals [1].

The geriatric population in developed countries, such as the USA, represents a big reservoir of tuberculosis infection across all racial and sex subsets. Clinical characteristics of tuberculosis in older adults can be unusual and may be confused with age-related illnesses [2]. Acute or chronic diseases, malnutrition, and the biological changes associated with aging can disrupt protective barriers, weaken microbial clearance mechanisms, and contribute to the predictable age-related decrease in cellular immune responses to microbes such as *Mycobacterium tuberculosis*. The diagnosis of tuberculosis can be problematic, and this curable infection is sometimes recognized only on postmortem examination. In addition, therapy for tuberculosis in elderly individuals is challenging because of the increased incidence of drug side effects. Also, hospitalized elderly persons are at especially high risk for reactivation of latent tuberculosis and are susceptible to new tuberculosis infection.

Although a higher percentage (80%-90%) of cases of tuberculosis in the old people occur amongst community inhabitants (individuals living at home), there is a reasonably higher (2-3-fold) incidence of active tuberculosis between nursing home residents [3]. The enhanced transmissibility of tuberculosis within group settings, such as jails, nursing facilities (nursing homes), chronic illness facilities, and homeless housings, has raised concerns about tuberculosis infection and disease in the institutionalized elderly population [4].

Positive tuberculin reactivity has been verified in association with long stay among inhabitants of long-term care services for old people, indicating that the risk of tuberculosis infection is higher in these settings [3,4].

Tuberculosis in older patients can present atypically [5]. Approximately 75% of elderly persons with tuberculosis disease manifest lung involvement [6]. In addition, disseminated or miliary

tuberculosis, tuberculous meningitis, and skeletal and genitourinary tuberculosis increase in frequency with advancing age [7]. Many older patients with tuberculosis may not reveal the classic features of tuberculosis (i.e., cough, hemoptysis, fever, night sweats, and weight loss). Tuberculosis in this people may present clinically with alterations in efficient capability (e.g., activities of daily living), chronic fatigue, cognitive impairment, anorexia, or unexplained low-grade fever [8]. Nonspecific symptoms and signs that range in severity from sub-acute to long-lasting and that continue for a period of weeks to months must aware clinicians to the risk that unrecognized tuberculosis is present. The Pattern of tuberculosis in elderly patients in Upper Egypt is not well-known so we aimed to assess the pattern of TB in elderly patients.

Patients

This Prospective observational study (cohort study) conducted at Qena Chest hospital and Qena university hospital for One year from July 2015 to July 2016 on patients with TB.

One hundred seventeen patients who were diagnosed with TB had been included. Ethics committee approved the study. Written informed consents were obtained from the entire patients.

Inclusion criteria

- Patients with active pulmonary TB.
- Patients with extra-pulmonary TB.

Methodology

The patients were evaluated regarding the incidence rate: for new cases, and relapse cases (pulmonary and extrapulmonary).

Investigations

All patients were subjected to:

- Complete blood count: (done by Coulter counter).
- Erythrocyte sedimentation rate (ESR): By westergreen methods, 1st and 2nd hours were collected.
- Sputum examination: Morning sputum or bronchoalveolar lavage samples submitted for diagnosis of tuberculosis.
- Tuberculin test: Done by Mantoux technique, a standard dose of 5 tuberculin units is injected intradermally (between the layers of dermis) and read 48 to 72 hours later. The reaction is read by measuring the diameter of induration (palpable raised, hardened area) across the forearm in millimeters. If there was no induration, the result should be recorded as "0 mm", the test was negative, and if the induration was >10 mm, it indicates positive test [9].
- Chest X-ray: Radiological features were recorded according to interpretation of the first chest X-ray taken when the patient stop at the hospital before a final diagnosis had been made. That included the location and lesion appearance. The radiological appearance of pulmonary TB lesion was categorized as typical fibrous nodular infiltrates and/or a cavitary lesion, consolidation, large opacity mimicking a mass or as others.

Location of TB lesion was classified as upper lobe involvement (upper lobe alone or upper with middle or lower lobe) or isolated middle and/or lower lobe involvement.

Initial clinical diagnosis (before final diagnosis) was categorized as pulmonary TB, bacterial pneumonia, lung cancer, or others (such as sarcoidosis, etc.). Extra pulmonary TB was assessed and diagnosed according to the site. Lymph node biopsies and histopathological examination was done for cases of tuberculous lymphadenitis, pleural fluid examination and adenosine deaminase (ADA) for cases of tuberculous effusion, also MRI spine was done for pott's disease and ascitic fluid aspiration for cases of tuberculous peritonitis.

After diagnosis of active pulmonary TB had been made and anti-TB medications ongoing, patients were seen 1 week after treatment and every 2 weeks afterward, with monitoring of any drug side effects.

Chest radiograph and microbiological study were done every month. Liver function tests were done 1 week after beginning of treatment and monthly thereafter. Patients were treated initially using the following regimen: Isoniazid, Rifampicin, Ethambutol and Pyrazinamide or Streptomycin. If drug induced hepatitis was suspected, anti-TB drugs were stopped and when liver function tests returned to normal, the anti-TB drugs were sequentially reintroduced except Pyrazinamide [10]. Mortality during treatment was recorded.

Statistics

Data was analyzed using SPSS advanced statistics version 22 (SPSS Inc., Chicago, IL). Statistical analysis of the two groups was determined with chi-square test. All values are reported as mean ± standard deviation (SD). A P-value (2-tailed) 0.05 was considered statistically significant. The student's t test was used when indicated for independent mean.

Results

This prospective study conducted on 117 patients with tuberculosis among them 41 elderly patients (≥ 50 years) and 76 young patients (<50 years) with the following result:

Parameter	Range		Mean ± SD
Age	18-97 Years		
Sex	Male	60(51.3%)	41.18 ± 18.014
	Female	57(48.7%)	
Residence	Urban	53(45.3%)	
	Rural	64(54.7%)	

Table 1: Distribution of the studied cases according to demographic data.

Table 1 showed that the mean age of the included patients was 41.18 years. 51.3% of the studied patients were male and 48.7% were female. 54.7% of patients lived in rural areas and 45.3% in urban.

ESR	Range	Mean ± SD
ESR after 1 Hour	25-120	79.48 ± 23.17
ESR after 2 Hour	40-180	98.91 ± 24.37

Table 2: Distribution of studied patients according ESR (Erythrocyte Sedimentation Rate).

Table 2 showed that the mean ESR after 1st hour was 79.48 and after 2 hour 98.91.

Parameter	Range	Mean ± SD
HB (g/dl)	7-15	10.40 ± 1.68
WBC (x10^9/L)	2.4-22	14.74 ± 4.22

Table 3: Showed that mean HB level was 10.40 mg\dl and mean WBC was 14.74. 87 patients had HB level <12 mg/dl.

Table 3 showed that 87 patients had HB level <12 g/dl with mean level 9.64 g/dl and 30 patients had HB level ≥ 12 g/dl with mean level 14.74 g/dl.

HB	Range	Mean ± SD
Patient <12 g/dl (N=87)	7-11.5	9.64 ± 1.11
Patient ≥ 12g/dl (N=30)	15-12	12.63 ± 0.88

Table 4: Distribution of HB level among included patients.

Table 4 showed that 87 patients had HB level <12 g/dl with mean level 9.64 g/dl and 30 patients had HB level ≥ 12 g/dl with mean level 12.63 g\dl.

WBC	Range	Mean ± SD
Leucocytosis cases>11 (N=99)	0	16.15 ± 2.68
leucopenia cases<4 (N=1)	2.4	2.4

Table 5: Distribution of WBC level among included patients.

Table 5 showed that 99 patients had leucocytosis with mean level 16.15 and 1 patient had leucopenia with mean level 2.4 and 17 patients within normal.

Age	Number	Range number	Mean ± SD	P-Value
Young Patients (<50 years)	76	18	29.91 ± 9.22	0
Elderly Patients (≥ 50 years)	41	50	62.07 ± 9.63	

Table 6: Correlation of the studied patients according to age.

Table 6 showed that there were high significant differences between studied patients according to age as higher mean in elderly patients (p=0.00).

Sex	Young group (<50)	Elderly group (≥ 50)	P-Value
	Number (%)		
Male	31(40.7%)	29(70.7%)	0.002
Female	45(59.3%)	12(29.3%)	

Table 7: Correlation between age and sex among studied patients.

Table 7 showed that there were significant differences between young and elderly patients according to the sex (p-value=0.002).

Residence	Young group (<50)	Elderly group (≥ 50)	P-Value
	Number (%)		
Urban	35(46%)	18(44%)	0.489
Rural	41(54%)	23(56%)	

Table 8: Correlation between young and elderly groups according to residence.

Table 8 showed that there were insignificant differences between young and elderly groups according to residence (p=0.489).

Sputum	Young group (<50)	Elderly group (≥ 50)	P-Value
	Number (%)		
Positive	37(48.5%)	22(53.5%)	0.375
Negative	39(51.5%)	19(46.5%)	

Table 9: Correlation between young and elderly according to sputum result.

Table 9 showed that when age of patients was correlated with other demographic data, we found that there were significant differences between age and sex of the patients (p-value=0.002) and insignificant differences between age of patients and residence, sputum results, tuberculin result (p-value=0.375).

TST	Young group (<50)	Elderly group (≥ 50)	P-Value
	Number (%)		
Positive	65(85.5%)	32(78%)	0.219
Negative	11(14.5%)	9(22%)	

Table 10: Correlation between young and elderly according to tuberculin skin test (TST) result.

Table 10 showed that there was a comparable relation between young and elderly groups according to TST results (p=0.219).

ESR	Young group (<50)	Elderly group (≥50)	P-Value
	Mean ± SD		
After 1 hr	73.79 ± 21.70	90.02 ± 22.31	0
After 2 hrs	94.09 ± 23.66	107.85 ± 23.37	0.003

Table 11: Correlation between young and elderly according to ESR level.

Table 11 showed that elderly group had significantly higher ESR levels than young group (p=0.000, 0.003 respectively).

HB	Young group (<50)	Elderly group (≥ 50)	P-Value
	Mean ± SD		
	10.43 ± 1.55	10.36 ± 1.91	0.823

Table 12: Correlation between young and elderly according to HB level.

Table 12 showed that there were insignificant differences between age of patients and HB level (p=0.8).

	Young group (< 50)	Elderly group (≥ 50)	P-Value
WBC	Mean ± SD		
	15.25 ± 3.75	13.80 ± 4.90	0.077

Table 13: Correlation between young and elderly according to WBC level.

Table 13 showed that there were insignificant differences between young and elderly according to WBC level (p=0.077).

C.X.R	Number (%)
Normal	20-17.1%
Bilateral	20-17.1%
Pleural effusion	3-2.6%
Whole Rt lung	19-16.2%
Whole Lt lung	2-1.7%
Rt upper lobe	30-25.6%
Rt lower lobe	4-3.4%
Lt upper lobe	12-10.3%
Lt lower lobe	7-6%
Cavitary lesion	20(17%)

Table 14: Distribution of the all studied patients according to chest X-ray.

Table 14 showed that CXR findings were normal in 17.1% of patients, 17.1% bilateral, 25.6% Rt upper lobe, 16.2% whole Rt lung, 10.3% Lt upper lobe, 6% Lt lower lobe, 3.4% Rt lower lobe, 2.6% pleural effusion and 1.7% whole Lt lung, also there were 17% with cavitary lesion.

C.X.R	Young group (< 50)	Elderly group (≥50)
	Number (%)	
Normal	16(13.6%)	4(3.6%)
Bilateral	9(7.6%)	11(9.5%)
Pleural effusion	3(2.5%)	0(0%)
Whole Rt lung	10(8.5%)	9(7.6%)
Whole Lt lung	1(0.8%)	1(0.8%)
Rt upper lobe	22(18.8%)	8(6.8%)
Rt lower lobe	3(2.5%)	1(0.8%)
Lt upper lobe	11(9.5%)	1(0.8%)
Lt lower lobe	1(0.8%)	6(5.5%)
Cavitary lesion	9(7.6%)	11(9.5%)

Table 15: Correlation between young and elderly according to C.X.R.

Table 15 showed that CXR findings were mainly present in young patients.

TB Types	Young group (< 50)	Elderly group (≥50)
TB lymphadenitis	12(10.2%)	3(2.6%)
TB effusion	4(3.4%)	0
TB peritonitis	1(0.8%)	0
TB breast abscess	1(0.8%)	0
Pott`s disease	0	1(0.8%)

Table 16: Correlation between young and elderly according to extrapulmonary TB types.

Table 16 showed that TB lymphadenitis was the most frequent type in both young and elderly groups.

Discussion

Tuberculosis (TB) is a chronic, granulomatous, bacterial infection that may show multisystemic involvement. It still constitutes a main worldwide health issue and it is estimated that nearly 33% of the people be infected worldwide. Main microbiological cause is *Mycobacterium tuberculosis* in the most of the patients. The disease may change into the active stage in 10% of cases and lungs are the most common site of involvement. Pulmonary tuberculosis (PTB) is a highly infectious that may spread in the initial period after infection [11].

Tuberculosis (TB) is one of the most prevalent and serious of all human infectious diseases and is still a major infectious disease global. Despite the implementation of strong TB initiatives, this highly infectious disease continues to affect all susceptible populations, including the aged people [12].

Atypical clinical signs of TB in elderly patients can result in delay in diagnosis and beginning of treatment; higher rates of morbidity and mortality from this curable infection can occur. Underlying illnesses, age-related decrease in immune function, the increased frequency of drug side effects, and institutionalization can complicate the overall outcome in elderly patients with TB [12].

In the present study we found that the mean age of the included patients was 41.18 years and 51.3% of patients were male and 48.7% was female.

In a review by Shaik et al. on pulmonary tuberculosis in rural geriatric populace of South India they conclude 50 patients in the age group of 18-59 years and 50 patients aged 60 years or above (geriatric subjects) who were diagnosed to have and treated for pulmonary TB and they detected that sex distribution was similar in adults aged 18-59 years (male: female=30:20) and elderly (male: female=36:14) patients. In the elderly group 32 (64%) patients were in age group 60-65 years,

13 (26%) were in the age group 65-70 years and the residual 5 (10%) were aged over 70 years. In the 18-59 year old individuals 12 (24%) patients were aged 18-30 years, 23 (46%) were in the age group 31-45years and the remaining 15 (30%) were aged 45-59 years [12].

Another study by Hussein et al. on pattern of pulmonary tuberculosis in elderly patients in Sohag Governorate: Hospital based study which included 124 elderly (>50 year) and 124 young patients (<50 year) with active pulmonary TB and was consistent with our result as they found that there was a similar male predominance in both groups (p=0.2) and also they found that mean ages of the elderly group and young group were 60.5 ± 9.1 years and 31.6 ± 10.8 years, correspondingly (p<0.0001) [13].

In agreement with our results, Wang et al. found that the male sex predominated in both groups, making up approximately 75%. There were no statistically significant differences between the two groups with respect to male predominance and of the 157 culture-proven pulmonary TB patients, 83 patients aged 60 and older (52.9%) and 74 patients aged 18–59 (47.1%) participated in the study. The aging group had a median age of 74 years of age and the young group had a median age of 46 years of age. [14]. In El-Khushman et al. study 137 patients were diagnosed during the studied period with a mean age (range) of 48.43 ± 14.65 (14-83) years. The male constituted 61% of the patient studied which is comparable to our study results [15]. In Lindoso et al. study on tuberculosis patients progressing to death they reported that median age was 51 years (16 to 98 years), 53 years in females (17 to 98 years) and 50 in males (16 to 93 years) (p>0.05); and 75.5% of deaths were in males [16]. Of the total 581 patients with pulmonary TB included in Cantalice et al. study, 391 (67.3%) were males and 190 (32.7%) were females. The mean age of population studied was 38.5 years (range, 15-87 years). The elderly group included patients ranging in age from 60 to 87 years (mean, 66.6 ± 16.5 years). The mean age in the non-elderly group was 31.4 ± 9 years (range, 15 to 49 years) [17]. Tagaro et al. study during the 5-year period, of the 588 registered TB patients they agree with our result as they found that 330 (56%) were male and 257 (44%) female (in one patient sex was not documented); 142 (24%) were children aged 0–14 years, 327 (56%) were adults aged 15–54 years and 119 (20%) were older adults aged >55 years [18]. In contrary to our result Marjani et al. study, 872 new cases of pulmonary tuberculosis (PTB) were enrolled out of which, 431 (49.4%) were males and 441 (50.6%) were females. Iranians accounted for 680 (78.0%) individuals and 192 (22.0%) were not Iranian. The mean age of patients was 51.8 + 21.4 years (range 14 to 90 years) [19]. Regarding residence we found that in the present study 54.7% of patients lives in rural areas and 45.3% in urban, Rawat et al. found that the younger patients ranged from 18 to 59 years of age and the old patients extended from 60 to 82 years. Male high prevalence was seen in both the groups. Majority of patients in both groups belonged to rural area [20]. In Cantalice et al. study, they found that in elderly patients included in the study 70.3% lives in State capital, 27.9% lives in Metrop. Reg, 0.9% lives in Rural and 0.9% lives other states [17].

We found in the present study that 50.4% of the patients were sputum positive and 49.6% were negative and 82.9% of the patients were tuberculin positive and 17.15 were negative. In agreement with our results, Hussein et al. study positive sputum direct smear for AFB was the most common method of pulmonary TB diagnosis in the both groups, but significantly more common in young than aging patients (P-value=0.04). Positive sputum culture was significantly frequent in elderly patients (p=0.02) as 62.1% of the elderly patients were sputum positive [13]. Wang et al. study agreed with our results as they found that positive acid-fast bacilli sputum smear was 59.0% in group age >60 year and in age <60 year was positive in 75.7% [14]. Another study by El-Khushman et al., three samples of sputum were analyzed from each patient for the presence of AFB, only 70 (51%) of patients were diagnosed depending on sputum examination. In sputum, negative patients with high clinical doubt a diagnostic fiberoptic bronchoscopy was performed [15]. Cantalice et al. study found that positivity in sputum smear microscopy was comparable in the two groups, ranging from 65.1% in the elderly group to 69.4% in the non-elderly group. Similarly, sputum culture showed high positivity in the sample as a whole (>72%), lacking statistical importance.

The tuberculin test also showed similar reactivity between the groups (>75%) it was positive in 75.5% of elderly group patients and 79.8% of non-elderly patients with insignificant difference between two groups [17]. Kwon et al. study was comparable to our results as they found that patients with positive smears in elderly group was 57% and 48% in younger group with insignificant differences between two groups as regard sputum positivity [21]. Rawat et al. found that 90% of the elderly patients included in the study were sputum positive and in younger group the sputum positive accounted to 84% of patients [20].

Rawat et al. study, disagreed with our result as they found that tuberculin test was less frequently positive in elderly patients as compared to young adults (36% vs. 65%) [20]. The possible explanation for these findings may be due to the fact that tuberculosis sensitivity is said to wane with age.

In disagreement of our result positive tuberculin skin test was also higher in younger TB patients than in older TB patients in a previous study (86% vs. 68%, p=0.03) [22]. A decrease in immunological status associated with aging could have caused the lower positive rate [7].

However in Kwon et al. study, the positive rate in tuberculin skin test did not differ between the groups. It was positive in 93% of the elderly patients and younger patients. It could not explain the exact cause of the high positive rates in the tuberculin skin test in older TB patients [21].

As regard laboratory investigations we found that mean ESR after 1st hour was 79.48 and after 2 hour 98.91 and mean HB level was 10.40 mg\dl and mean WBC was 14.74. 87 patients had HB level <12 mg\dl with mean level 9.64 mg\dl and 30 patients had HB level ≥ 12 mg\dl with mean level 12.63 mg\dl, 99 patients had leukocytosis with mean level 16.15 and 1 patient had leukopenia with mean level 2.4.

Erythrocyte Sedimentation Rate (ESR) is almost always raised in active TB. White cell count is usually normal or rather low. It may be sometimes raised in tuberculous pneumonias or in miliary TB where a leukomoid reaction may sometimes suggest other diagnoses. Anemia (usually normochromic normocytic) is common in pulmonary TB, but the more bizarre blood dyscariasis characteristic of miliary TB are unusual and if present, most likely imply some disease with cryptic miliary spread [22-24]. Dongola et al. found that 98% of patients showed a high ESR result and 66% of patients had an ESR in the order of Figures 1-3. It has been stated that the ESR is always raised in active tuberculosis. This suggests that ESR is apparently a good measure of activity but it is not sensitive [25].

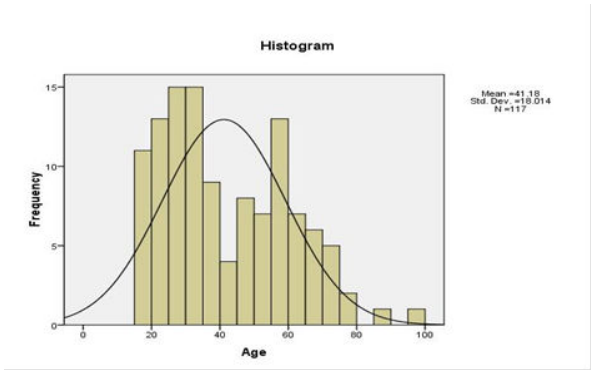

Figure 1: Distribution of patients according to age.

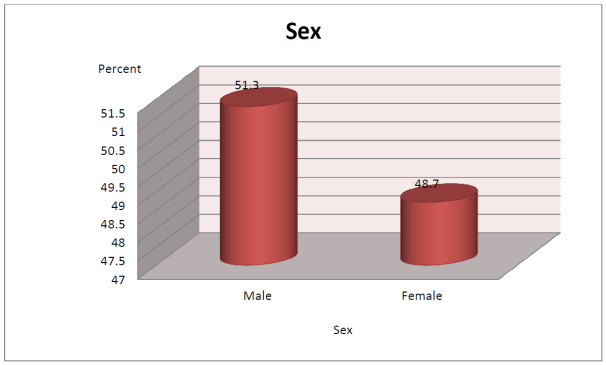

Figure 2: Distribution of patients according to sex.

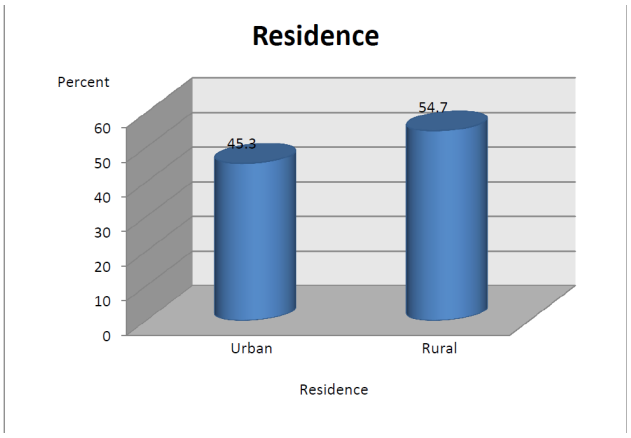

Figure 3: Distribution of the studied patients according to residence.

In a study by Hussein et al. they included 124 elderly (>50 year) and 124 young patients (<50 year) with active pulmonary TB and they found that mean Leukocytic count 10^9/L in elderly patients was 7 and mean Leukocytosis (>11 × 10^9/L) was 20, mean ESR was 91 mm/hr (13). According to WHO (2011), we used age of 50 years as a definition of elderly [26]. In the present study we found that there were significant differences between studied patients according to age as higher number of patients were aged >50.

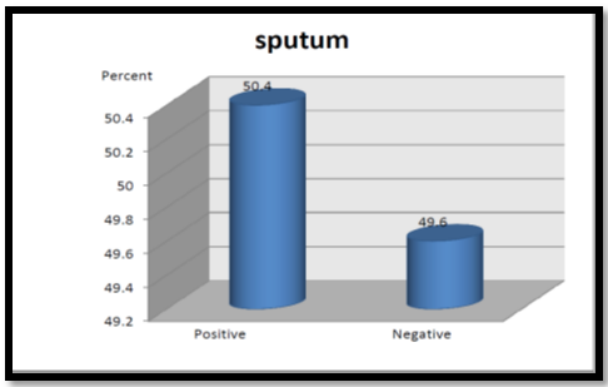

Figure 4: Distribution of the studied patients according to sputum result.

In a study by Pesut et al. to detect Tuberculosis Incidence in Elderly in Serbia, they found that the total average age-specific tuberculosis incidence rate for the old aged [1] 65 during 1992-2006 in Central Serbia was 64.05/100 000 populace (95% confidence interval [CI], 60.65-67.44): 79.87 (95% CI, 75.27-84.47) in men and 52.05 (95% CI, 48.91-55.19) in women. The total tuberculosis incidence rate showed a slight, non-significant decrease in the observed period (y=34.519-0.0882x; R2=0.030, P=0.535), and the rate in patients aged ≥65 years displayed a rise, but without statistical importance, both overall (P=0.064) [27]. In another study by Rawat et al. they comprised 138 patients and found that 50 were in elderly and 88 were in young adult age group [20]. In a study by Kwon et al. they enrolled all adult patients aged >20 years who were treated for newly diagnosed active TB and found that there were more definite cases in the older TB patients than in the younger TB patients (81% vs. 68%, p=0.002) [21] (Figures 4-7).

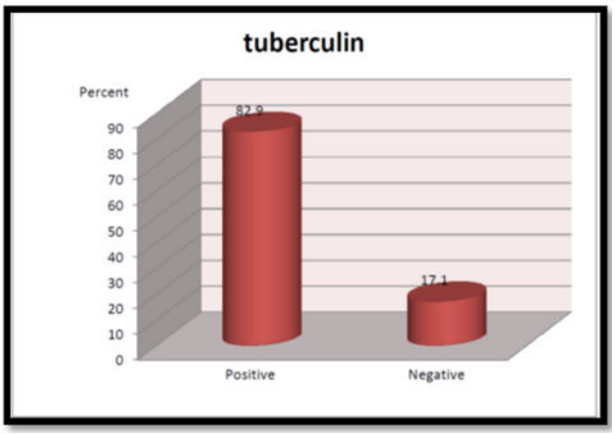

Figure 5: Distribution of the studied patients according to tuberculin test result.

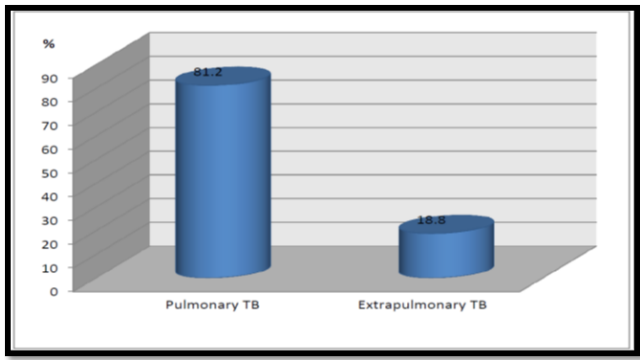

Figure 6: Distribution of the studied patients according to TB type.

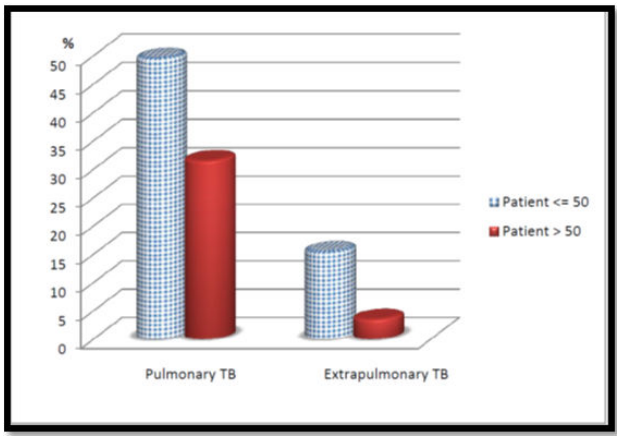

Figure 7: Correlation between young and elderly according to TB type.

Mori et al. showed that the epidemiologic situations with respect to TB in Africa and the United States are tremendously different, with incidence rates of smear-positive TB for the whole populace of 124 and 1.1, respectively. A similar variance appears with regard to age specific statistics. The incidence rate curve in Africa has a peak at 25 to 44 years of age that goes down later, while in the United States of America it goes up monotonically with age [28].

As for the age composition of the patients, in Africa the age group of 15 to 44 years comprises 74% of the population, whereas in the United States it is only 24%, and instead the age group of 65 years and older occupies 35% (only 4% in Africa). It seems that in high-prevalence sites TB is seriously infecting the most productive age groups. On the other hand, TB is now becoming a serious health issue of elderly persons in low-prevalence countries [28]. In the present study, when age of patients was correlated with other demographic data, we found that there were significant differences between age and sex of the patients (p-value=0.002) and insignificant differences between age of patients and residence, sputum results, tuberculin results (p-value 0.489, 0.375, 0.219 respectively). As cited by Perez-Guzman et al. [7] in their meta-analysis of comparative studies between elderly and non-elderly TB patients, most of the available studies stated a male predominance among aging TB patients. For Japan in 2005, notification rates of males and females per 100,000 populations considered separately were 10.2 vs. 8.7 for 0 to 39 years, 24.5 vs. 9.0 for 40 to 59 years, and 70.5 vs. 30.2 for 60 years and older indicating a remarkable sex difference beyond the age of 40 years. For the United States in 2007, the rates were 4.0 vs. 3.1 for age group of 0 to 44 years, 7.4 vs. 3.3 for 45 to 64 years, and 9.4 vs. 4.9 for 65 years and older, also demonstrating a wider gap after the age of 45 years. The similar male predominance was reported from Hong Kong [29]. The cause for this male high prevalence in the TB rate may be at least partly attributed to the more extensive social activity of males, exposing them to infection and in turn leading to TB disease [7]. The changes in immunity associated with advanced age is well-known from many observations of waning tuberculin reactions, or even anergy, among both TB patients and healthy subjects at the upper extreme of age [30]. In disagreement with our study, Shaik et al. study found that the gender distribution was parallel in adults aged 18-59 years (male: female=30:20) and elderly (male: female=36:14) patients [12]. Similar findings were reported in other studies, [15,31,32] where the proportion of male patients ranged from 61%-67.6%. There was no statistically significant difference in sputum smear positivity and ranking between elderly patients and younger aged 18-59 years [12]. This observation is similar to that documented in other studies [13,20,21]. Wang et al. disagreed with our result as they found that there were no statistically significant differences between the two groups with respect to male predominance. Besides, there was a lower frequency of sputum acid-fast bacilli positivity in the elderly. This may be because it is more difficult to obtain adequate sputum from elderly patients. This could be attributed to their inability to produce sputum (due to weakness or to lack of cooperation) or to the "lower" quality of the delivered sputum, i.e., more saliva secretion than pulmonary secretion [14]. Also in disagreement with our result Craig et al. found that there was no statistically significant difference in age between males and females. Continents of origin were: Europe, 29 vs. 5% (73/247), including the UK 24% (60/247); Africa 42 vs. 5% (105/247); Asia 27% (66/247); other 1 vs. 2% (3/247) [33]. Cantalice et al. found that there were insignificant differences between elderly and non-elderly patients as regard residences, also they showed that positivity in sputum smear microscopy was comparable in the two groups, ranging from 65.1% in the aging group to 69.4% in the non-elderly group. Also, sputum culture presented high positivity in the sample as a whole (>72%), without statistical importance. The tuberculin test also revealed similar reactivity between the groups (>75%) [17]. In Rawat et al. study, they found that tuberculin test was less commonly positive in old patients as compared to young adults (36% vs. 65%) [20]. Similar observations have been reported by other studies [22,34,35].

The probable explanation for these outcomes may be due to the fact that tuberculosis sensitivity is said to diminish with age. There was no difference in the proportion of patients with bacteriologically confirmed illness between the two groups. Higher positivity percentage may be due to that we excluded all smear negative pulmonary tuberculosis patients for having minimal diagnosis bias.

In disagreement with the findings of other authors, who demonstrated that up to 80% of elderly patient's present sensitivity on the tuberculin test [36]. In contrast, other authors have stated that younger patients present larger sensitivity on the same test [22]. We found that on laboratory investigations that there were significant differences between age of patients and E.S.R after 1st hour and 2nd hour (p-value 0.000, 0.003 respectively). In agreement with our result, Van den Brande et al. found that ESR level was significantly higher in elderly than in young patients (p=0.01) and this is probably due to

normal increase of ESR with age [37]. This was also in agreement with Lee et al. [10]. We found also that there were insignificant differences between age of patients and HB level and WBC (p-value 0.823, 0.077 respectively). Chand et al. and Lee et al. also reported that complete blood counts showed no significant differences between mean leukocyte counts or the incidences of leukocytosis and this result was in agreement with our results [10,38]. On the other hand, Rawat et al. reported that anemia and hypoalbuminemia were considerably more prevalent in older patients. This result could be clarified by the fact that older persons suffer from malnutrition much more frequently than younger people (20). These findings are consistent with those of Alvarez [34] and Morris et al. [39]. Also, in disagreement with our results, Cruz-Hervert et al. recorded that elderly patients had a lower leukocytic count which could be explained by the age linked immunosuppression (the lower cutting edge of old at 65 years for this study compared to 50 years for our study) [40]. As regard chest x-ray (CXR) findings in the present study, we found normal examinations in 17.1% of patients, 17.1% bilateral, 25.6% Rt upper lobe, 16.2% whole Rt lung, 10.3% Lt upper lobe, 6% Lt lower lobe, 3.4% Rt lower lobe, 2.6% pleural effusion and 1.7% whole Lt lung. CXR findings were mainly present in patients aged ≤ 50 and cavitations were in 5 (4.2%) Patient aged >50. Babu et al. study found that bilateral involvement, lower zone predominance and far advanced disease were more prevalent in elderly compared to adults [41]. Similar observations were reported in tuberculous diabetics by Hariprasad et al. [42] who reported that lower lung field is involved more commonly in older age group than adults. Rawat et al. reported "a higher involvement of lower zone (24.0% vs. 7.9%) and far advanced lesions (32.0% vs. 14.7%) in the elderly" [20]. In Babu et al. study, minimal lesions were predominantly found among young patients as compared to elderly [41]. El-Khushman et al. found that the most common radiological findings were different lung opacities and infiltrates, which were present in 71 (52%) of cases. The right lung was involved in 70 (51%), left lung in 27%, and bilateral lung involvements were reported in 22% of cases. The upper lobes were affected by the disease in 86 (63%) of cases. The lower lobes were noted to be involved in 17% of patients. Middle lobes with or without lower lobes' association were detected in 20% of cases [15]. Shaik et al. found also that on radiological investigations, elderly patients had a statistically important higher incidence of lower lobe infiltrates (p=0.005) compared with adults aged 18-59 years, all other radiological findings were comparable and they found that cavitations were more common in adults which was consistent with our results [12].

Radiological evaluation by Hussein et al. showed that upper lobe affection was more common in young individuals. It was 87.9% and 70.2% for old and young groups respectively but isolate mid or lower lobe involvement was more common in the old group being 29.8% for old compared to 12.1% for young. The lobar tendency was significant (p=0.0006). Typical fibrous nodular type with or without a cavity lesion was significantly more common in the young than aging patients (p-value <0.0001), whereas consolidation or large opacity mimic a mass was significantly more frequent in the elderly than in young patients. P values were 0.001, 0.01, respectively [13].

In the present study we found that 81.2% of patients had pulmonary TB and 18.8% had extra pulmonary TB, and pulmonary TB mainly affected Patient ≥ 50 while extra pulmonary disease mainly affected Patient ≤ 50. Schluger study stated that old patients are more probable to have extra pulmonary TB including miliary disease [43]. In Japan, 74% of pulmonary TB patients were bacteriologically confirmed cases for the age group 15 to 59 years, compared with 86% for individuals aged 60 years or older. A similar propensity was also seen in Hong Kong [29,31] and in the meta-analysis by Perez-Guzman et al. [7]. Kwon et al. found that there were important differences between the groups according to sites of infection. Pulmonary TB was more common in older patients and extra pulmonary TB was more common in younger patients. In cases of pulmonary TB, there was insignificant change in lobar predominance (upper lobe vs. middle or lower lobes) between the age groups. However, older TB patients showed a higher percentage of endobronchial TB (23/173, 13%) than did younger TB patients (12/222, 5%) (p=0.007). In the case of extra pulmonary TB, older patients had an inferior rate of tuberculous lymphadenitis than younger TB patients had [21].

Conclusion

In conclusion, Tuberculosis (TB) in old people is a worldwide problem. The current study documents important variances in clinical and radiological findings of pulmonary TB in geriatric patients. Geriatric patients also experienced more frequent occurrence of side effects, failure of cure and death and active pulmonary TB. Sputum for AFB remains a significant, easy and cheap method for TB diagnosis, but might not be continuously supportive in early diagnosis.

Recommendations

A high index of doubt and prompt investigations in old patients are obligatory for early diagnosis and treatment of TB hopeful for reducing TB associated morbidity and mortality. Cautious checking of elderly patients for side effects of anti-TB treatments is indicated.

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