Original Research Article

Pulmonary tuberculosis in the elderly: Epidemiological, clinical, and evolutionary aspects

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ABSTRACT

Aims: this study aimed to investigate the epidemiological, clinical, and evolutionary aspects of pulmonary tuberculosis in the elderly and to determine the factors associated with death.

Study design: This was an exhaustive, descriptive, and analytical retrospective study

Place and Duration of Study: Pneumo-phtisiology department of Fann National Teaching Hospital Center over three years, from January 1, 2019, to December 31, 2021.

Methodology: This was ~~an~~ a study using medical records of patients aged 60 and over hospitalized in the pneumo-phtisiology department. Data were collected on a pre-established from patient medical records entered with Microsoft Excel 2019 software. Data analysis was performed with Statistical Package for Sciences Socials (SPSS) version 18

Results: we collected 620 medical records of hospitalized patients aged 60 and over, 69 of whom were diagnosed with pulmonary tuberculosis, standing for a prevalence of 11.12%. The average age was 67.13 years, with a sex ratio of 3.92. The 60 to 65 age group was the most represented (n=36 or 52.17%). Smoking and alcoholism were frequent ~~in 47~~, 82% and 17.4% respectively. A previous history of TB infection was found in 23.19% of cases and TB contagion in 20.3% of cases. An underlying condition was at least observed in 50.72% of patients, dominated by diabetes (29%) and hypertension (23%). Co-infection with HIV-1 and tuberculosis was found in 2 patients (3%). The time to consultation was 75 days [3- 180 days]. Symptomatology was polymorphic, dominated by cough (n=65; 94.20%), altered general condition (n=63; 91.30%), sputum (n=58; 84.06%), fever (n=53; 76.81%) and dyspnea (n=47; 68.12%). 46 patients (66.7%) had a BMI < 18.5 kg/m2. Physical signs were dominated by pulmonary condensation (n=52; 75.36%), and a fold of undernutrition was noted in 21.74% of cases. Microbiological evidence was 92.75% and 64 patients (92.75%) were susceptible to rifampin. A rifampin-resistant strain was detected in 5 patients (7.25%) hospitalized in the MDR-TB unit. CRP (75.36%), anemia (68.18%), hyperleukocytosis (47.7%), and hyponatremia (27.54%) were the most frequent biological signs.

Alveolar syndrome (n=48 or 70%) and cavitary images (n=34 or 50%) were most frequently found on lung radiography, and for those who benefited from thoracic CT (n=36 or 52.17%), cavitary images were found in 24 cases (66.66%).

Pulmonary embolism (n=9 cases, i.e. 40.9%), superinfection (n=4), and excessive hemoptysis (n=3) were the most frequent complications. The mean length of hospital stay was 17 days [3-58 days]. The 2RHZE/4RH protocol was used for 87%. Two patients were placed on a second-line anti-tuberculosis treatment protocol.

Treatment was not specified in 7 patients (10.14%). The progression was favorable in 48 patients (69.56% of cases), with a case fatality rate of 30.44%. Dyspnea, chest pain, anemia, hyperleukocytosis, and hyponatremia were associated with the risk of death.
Conclusion: The elderly are particularly exposed to tuberculosis, due to physiological aging of the immune system and co-morbidities. This study highlighted the diagnostic and evolutionary particularities of pulmonary tuberculosis in the elderly, as well as the associated fatal factors.

Keywords: [Pulmonary tuberculosis - Elderly - Senegal}

1. INTRODUCTION

Tuberculosis is a major public health concern, and the main mode of contamination is airborne. Nearly a quarter of the world's population is infected with M. tuberculosis. It is considered a global threat, affecting all parts of the world. The World Health Organization (WHO) estimated that 9.9 million cases and 1.5 million deaths will occur in 2020, corresponding to more than 4,000 deaths every day worldwide (214,000 of whom will also be infected with HIV), representing an increase in the number of cases for the first time in over 10 years [1,2]. This situation has been partly exacerbated by the coronavirus disease pandemic in 2019 (COVID-19). According to the WHO, the emergence of ~~the coronavirus disease pandemic in 2019 (~~COVID-19) limited access to tuberculosis diagnosis and treatment [1, 3-5]. Most people (nearly 90%) who develop the disease are adults, and more often men than women. An increased risk of tuberculosis and mortality is associated with immunocompromised populations, such as HIV-infected people, infants, and the elderly [7-8].

The latter are at considerable risk of developing respiratory diseases, including tuberculosis [7,9]. Worldwide, the incidence of tuberculosis in the elderly is around three times higher than in young people [10]. The increased risk of tuberculosis in people aged 60 is favored by immunosuppression, malnutrition, poverty, limited access to health services, and co-morbidities such as diabetes mellitus [11-12]. Physiological age, physical handicap, and social changes aggravated by chronic problems (degenerative disease) favor the appearance of atypical forms of tuberculosis in the elderly (60 years) [13-18]. Decreased immunity and age-related physiological effects lead to an increased burden of communicable and non-communicable diseases. Around 90% of tuberculosis cases in the elderly are due to endogenous reactivation [19]. The elderly are considered a major reservoir of M. tuberculosis infection, due to their increased susceptibility to new infections and reactivation of latent infections [7, 20].

Tuberculosis in the elderly presents a broad spectrum clinical pattern. The severity of the disease is explained by the usual importance of the initial lesions, which is linked to the delay in diagnosis, and by the frequency of morbid associations due to age.

In Senegal, people aged over 60 account for 474,700, or 3.5% of the general population, according to the latest census report carried out in 2013, with projections of 9% by 2050 [24]. The elderly, whose numbers are growing steadily worldwide, are particularly exposed to community-acquired infections, including pulmonary tuberculosis. Our work aims to study the clinical, diagnostic, therapeutic, and evolutionary particularities of pulmonary tuberculosis in the geriatric population.

2. material and methods

2.1 Study design and participants

Our study was conducted in the Pneumo-phtisiology Department of Fann National Teaching Hospital Center (CHNU de Fann), one of the level 3 Public Health Establishments in the Senegalese capital, Dakar (Senegal).
It was a retrospective, exhaustive, descriptive, and analytical study based on medical records of patients hospitalized in the Pneumo-phtisiology Department of CHNU de Fann during the period from January 1, 2019, to December 31, 2021.
We included all patients aged 60 years and older, from medical records of patients hospitalized for pulmonary tuberculosis during the study period. The diagnosis of pulmonary tuberculosis was based on the criteria defined by the National Tuberculosis Control Program (PNT).
They included patients with a cough lasting more than 2 weeks and with the following para-clinical test results (29):

- At least two sputa positive for AFB stain.
- One AFB-positive stain associated with chest X-ray abnormalities consistent with active pulmonary tuberculosis.
- An AFB-positive smear associated with a positive culture.
- Negative smear with persistent symptomatology on well-conducted non-specific antibiotic therapy and chest X-ray and/or CT scan abnormalities compatible with active pulmonary tuberculosis.
- GeneXpert positive on sputum (sputum, tubing, fibroscopy).

This study did not include patients:

- Who died before starting anti-tuberculosis treatment.
- Whose medical records were incomplete.

2.2. Data collection

Data were collected on a pre-established form from the consultation register and the medical records of patients aged 60 and over hospitalized for pulmonary TB.
The data collection form included:

- Socio-demographic aspects: age, sex, and profession.
- medical history: notion of tuberculosis contagion, history of tuberculosis,
- Lifestyle: alcohol intoxication and tobacco, exposure to chemical products, etc.
- Comorbidities: HIV status, hypertension, diabetes, asthma, COPD, etc.
- Reasons for consultation
- Time elapsed between onset of symptoms and hospitalization (time to hospitalization)
- Clinical aspects
- Paraclinical aspects
- Progression
    - Cure: The cure is confirmed if the patient has taken their treatment regularly and if all bacteriological tests (smears and/or cultures) are negative, with clinical and radiological improvement.
    - Failure: smear, GeneXpert, or culture positive at M5 or M6
    - Death: any patient who died during treatment (all causes)
    - All patients were treated according to PNT protocols.

- Length of hospital stay

2.3. Statistical analysis

Data were entered using Microsoft Excel 2019. The descriptive study involved calculating frequencies and proportions for qualitative variables and means and standard deviations for quantitative variables. Data analysis was performed using SPSS version 18 software (Statistical Package for Social Sciences).

Comparisons were made using the student's t-test, the Chi 2 test, the Mann-Whitney test, and Fischer's exact test, according to their conditions of applicability. For all these tests, the significance level (p) was $p<0.05$.

3. Results

3.1. Epidemiological aspects

During the study period, 620 hospitalized patients aged 60 and over were recorded, 69 of whom were diagnosed with pulmonary tuberculosis, representing a geriatric TB frequency of 11.12%. The mean age was 67.13 years with a sex ratio of 3.92. The 60-65 age group was the most represented (52.2%). The majority of patients (52.17%) came from Dakar. Smoking and alcoholism were found among men, with proportions of 47.82% and 17.4% respectively. The existence of at least one underlying condition was found in almost half the patients (n = 35, 50.72%). The most frequent comorbidities were diabetes (29%) and hypertension (23%). Among the study population, 16 had a history of tuberculosis (23.19%). Of 64 patients screened for HIV, only 2 were positive, standing for a seroprevalence of 3%, including one case with serotype HIV-1 and the other with serotype HIV-2 The notion of tuberculosis contagion was found in 20.3% (n =14) of patients (specify the source of contamination in elderly patients). The consultation timespan was 75 days, or 2.5 months, with extremes of 3 days and 180 days (**Table 1**).

Table 1: Socio demographic characteristics of Pulmonary tuberculosis in the elderly at the pneumo-phtisiology department of Fann National Teaching Hospital Center from January 1, 2019, to December 31, 2021

Variables	Effectifs N=69	Pourcentages %
Median age (years)	67.13	
Age group (years)	**n=69**	
[60-65]	36	52.2
[66-70]	17	24.6
[71-75]	2	02.9
[76-80[	9	13.04
>80	5	07.25
Male	56	80.0
Residence	**~~N=69~~**	
Dakar	36	52.2
Suburbain		36.2
Other regions		10.1
ATCDS TB	**16**	23.2
Contage TB	**14**	20.0
Life style	**~~N=69~~**	
Alcohol	12	17.4

Tobacco	33	47.8
Others	12	17.4
Comorbidities	**N=35**	
Diabetes mellitus	20	29.0
Hypertension	16	23.2
Others (Asthme, BPCO)	11	16.3
HIV positive	02 (n=64)	03.0
Time to consult (days)	17[3-58] jours	
Hospitalisation stay (days)	75[3-180] jours	

- **Clinical and paraclinical aspects**

The most frequent clinical signs were cough (n=65; 94.20%), altered general condition (n=63; 91.30%), sputum (n=58; 84.06%), fever (n=53; 76.81%) and dyspnea (n=47; 68.12%) (**Table 2**). Physical signs were dominated by pulmonary condensation (75.36%).

Table 2: Distribution of patients by clinical signs and radiological image

	Abnormalities	Effectifs (n/N)	Pourcentage (%)
Clinical signs	Cough	65	94.20
	altered general condition	63	91.30
	Sputum production	58	84.06
	Fever	53	76.81
	Dyspnea	47	68.12
	chest pain	37	53.62
	Night sweats	21	30.43
	Haemoptysis	9	13.04
Imaging			
Pulmonary radiography	alveolar syndrome	48	70
	cavitary images	34	50
	Alvéolo-interstital syndrome	8	11.6
	Interstitial syndrome	5	7.25
Chest scan	Cavitary images	24	66.66

A notion of unquantified weight loss was described in 66.7% (n = 46). Undernutrition was noted in 15 patients (21.74%). Bacteriological evidence based on direct examination of sputum for AFBs was positive in 92.75%. Genexpert was positive in

(64) patients. It was sensitive to rifampicin in 92.75% of patients, with rifampicin resistance in 7.25% (n = 5) of patients, requiring hospitalization in the Multidrug-resistant tuberculosis (MDR-TB) unit of Fann Hospital, Dakar.
CRP was positive in 75.36%. Anemia was the most common finding (68.18%), followed by hyperleukocytosis (47.7%) and hyponatremia (27.54%). On chest X-ray, alveolar syndrome was most frequent (70%), followed by cavitary syndrome (50%).
Chest CT scan was performed in 52.17% of patients, and cavitary images were found in 66.66% (**Table 3**)

Table 3: Distribution of patients by complications

Type of Complication	**Effectif (N=69)**	**Pourcentage (%)**
Pulmonary embolism	9	13.05
Superinfections	4	6
Profuse haemoptysis	3	4.35
Confusion syndrome	2	3
Diffuse interstitial lung disease	2	3
Decompensated diabetest	1	1.45
Syndrome d'activation macrophagique	1	1.45
No complications	47	68.12
Total	69	100

At the time of hospitalization, 87% (n = 60) of patients were on the 2RHZE/4RH protocol. A strain resistant to rifampicin was detected in 5 patients or 7.25% who were hospitalized in the TBMR unit.
In terms of evolution, 31.88% of patients presented a complication during their hospitalization, dominated by pulmonary embolism (40.9%), followed by 4 bacterial or viral superinfections (n = 1) and profuse hemoptysis (n = 3).
The average length of hospital stay was 17 days, with extremes of 3 and 58 days.

- **Outcome and lethality**

The outcome was favorable in 69.56% (n = 48) of patients, and the death rate was 30.44% (n =21). Lethality was not associated with patient age (p=0.7), gender (p=0.6), infectiousness (p=0.4), or the existence of underlying conditions (p=0.3). However, it was higher among new cases (37.5%), with no significant statistical difference (p=0.5).
On the other hand, in multivariate analysis, dyspnea (p=0.03), chest pain (p=0.04), anemia (p=0.01), hyperleukocytosis (p=0.02), and hyponatremia (p=0.04) were associated with death (**Table 4**).

Table 4: Death associated factors

	Successful		Death		
					P value
Age					
Mean age	66,88			67,71	0,7
Médian age	64,00			67,00	

	Number	%	Number	%	P value
Genre					
Male	39	70,9	16	29,1	0,6
Female	9	64,3	5	35,7	9
Clinical signs					
Fever	35	80	16	76	0.9
altered general condition	44	91	19	90	0.8
Cough	42	95	19	90	0.5
Sputum production	37	84	17	81	0.6
Chest pain	22	43	13	62	0.04
Dyspnea	27	48	20	78	0.03
Haemoptysis	6	14	3	14	0.8
Biological signs					
Anemia	37	52.6	16	23.2	0.01
Leucopenia	2	4.5	2	9.5	0,3
Hyperleucocytosis	21	43.8	12	57.1	0.02
Thrombopenia	4	55.6	5	44.4	0,4
Hyponatraemia	10	20.8	9	42.9	0.04
Hypokalaemia	5	11	3	14	0.7
Comorbidities					
Yes	23	66.7	7	23.3	0.3
No	25	64.1	14	35.9	

- Discussion
- Epidemiological aspects

With the increase in life expectancy and the number of elderly people, it is to be expected that, if measures are not taken, this condition will increase in this category of the population [9]. Thus, tuberculosis in the elderly will be a major public health problem that must be taken into account in the National Tuberculosis Program Control (PNT).

The geriatric incidence of tuberculosis in this study (11.12%) was comparable to the results of studies carried out in Senegal (12.8%) [26] and Nigeria (12%) [27], as well as in India, where rates varied between 14 and 16.6% of all tuberculosis cases [27-28]. A study carried out in the geriatric department of Fann Hospital by Khai Ahmed [29] found a lower frequency of pulmonary tuberculosis with 5.7% of all pulmonary pathologies. This prevalence of geriatric tuberculosis is linked to factors such as immunosenescence, with the risk of endogenous contamination, poverty, and precariousness, since most elderly people do not receive a retirement pension. It is also linked to promiscuity, with the risk of exogenous contamination, the onset of diabetes -particularly NIDDM for which advanced age is a risk factor- malnutrition, which is frequent in this population category, HIV, liver disease, and chronic obstructive respiratory insufficiency [9].

The mean age in our study was 67.13 years, with a frequency peak between 60 and 65 years (52.17%). Similar results have been reported by Yacoub et al [36], the Swiss Lung League [33], and Loudadsi et al [37] in Morocco, with mean ages of 67, 65, and 69 respectively. Concerning age, Tidjani et al [32] in Lomé noted that the majority of tuberculosis cases were in the 60-79 age bracket.

In our study, men standed for the higher proportion (80%), with a sex ratio of 3.92. This male predominance was also found in studies by Gargouri [31] in Sfax; Tidjani et al [32] in Lomé; Toure et al [26], in Dakar; the Swiss Lung League [33], and Salamon in France [34]. However, Fettal et al [35] in Algeria noted a female predominance, with 10 women out of a total of 17 cases of tuberculosis, giving a sex ratio of 0.56. The male predominance of tuberculosis is classically described in the literature [26, 31-34].

This male predominance can be explained in part by the fact that men, who make up the bulk of the productive force, are more exposed to risk factors for the onset of tuberculosis, including smoking, alcoholism, high-risk professions, high-risk environments, the notion of contagion, and a history of tuberculosis...

These findings follow the epidemiological trend of tuberculosis in Senegal [26].

In our study, smoking and alcoholism were observed solely in men, with proportions of 47.82% and 17.4% respectively. These factors have been found in other studies [32,33, 36, 37]. A descriptive study of a cohort of 100 patients aged 50 in Himachal Pradesh found 68% to be smokers [38]. Toure [26] reported smoking in 50% of patients and alcoholism in 20.8%, and Maddeh in Jendouba, Tunisia, 46%[39]. In contrast, Mejdoub et al [40] in Tunis reported a 100% frequency of tobacco intoxication. Gargouri [31] in Sfax, Tunisia, noted the presence of alcoholism in 9% of patients.

Thus, smoking cessation interventions focused on the elderly are necessary. Socio-demographic factors, as well as factors inducing a fragile immune system, such as smoking and alcoholism, must be taken into account in the fight against TB.

In our study, the notion of tuberculosis contagion was found in 20.3% of patients. In contrast, Toure [26] found a proportion of 12.5%.

Regarding previous tuberculosis, the proportion was 23.19% in our study, compared with 16% in that of AFIF et al [56] in Casablanca and 25% in that of Neffati [41].

Associated comorbidities in the elderly constitute a challenge for both diagnosis and treatment of tuberculosis [42].

The proportion of patients with diabetes was 28.99% (n = 20), hypertension 23.9%, asthma 2.9%, and neurological pathologies 2.9%. Gargouri [31] in Sfax, Tunisia, reported the presence of diabetes and hypertension with prevalences of 70% and 36% respectively. Toure [26] in Dakar found diabetes in 37% of patients and hypertension in 8.3%. No patient in this study had asthma.

Diabetes and hypertension are two frequent pathologies in the elderly. Moreover, diabetes is associated with immunodeficiency, which can lead to serious infections or the reactivation of latent infections. This immunodeficiency is often the source of asymptomatic infections, delaying diagnosis. Additionally, there's a two-way interplay between diabetes and TB: TB unbalances diabetes, and unbalanced diabetes sustains TB." Thus, the presence of diabetes should prompt rigorous clinical and therapeutic monitoring, especially ophthalmological, with discontinuation of ethambutol at the slightest sign.

The prevalence of HIV/TB co-infection was 3% (n =2) of patients. Bouytse [43] in Rabat reported a seroprevalence of 0.5%, and Toure [26] found 3 cases of HIV. This low prevalence of HIV in TB in the elderly may be explained by a lack of active search, whereas WHO recommendations stipulate systematic screening for retroviral serology in all TB patients and active search for TB in all patients living with HIV, but it may also be explained by the decline in sexual activity in the elderly. The Swiss Lung Association [33] recorded 2.6% of AIDS-associated TB patients, half of whom were aged 65 and over. This rate can be explained by the mobilization of screening campaigns, close collaboration between tuberculosis and AIDS control programs, and free antiretroviral treatment and its application to all tuberculosis.

- **Clinical aspects.**

The time to diagnosis in our study was 75 days, corresponding to 2.5 months. Sellami [44] in Tunis reported a similar result, with an average delay of 78 days. On the other hand, Bouyste [43] in Rabat found a lower result with a duration of 59 days. Studies by Sahnoun [45] in Tunis and Toure [26] in Dakar reported a delay of 98 days and 150 days respectively.

There are several reasons for this long delay, including the latent form of the disease, lack of information on the disease, reliance on self-medication and traditional healers as first-line treatment, and the often-atypical semiology of infections, which can lead to misdiagnosis. Signs and symptoms of latency don't alert patients and their families, not to mention ignorance of the signs of TB. All these factors can lead to delays in diagnosis and treatment.

A study carried out in Guinea by A. Camara [46], revealed that 54% of patients were unaware that they had signs of tuberculosis, thus explaining the long delay before consultation.

In our study, all the functional signs of tuberculosis were present to varying degrees. Chronic cough was the most prominent symptom, observed in 94.2% of cases. Similar findings were reported by Tidjani et al. in Togo (93.3%) [32], Loudadsi in Morocco (98%) [37], and Toure [26] in Dakar among patients living with HIV (100%). However, Majdoub and Maddeh in Tunis found lower prevalence rates, with values of 55% and 14%, respectively [39-40].

Dyspnea was noted in 68.12% of patients, a result comparable to the study by Bouyste in Rabat (62%) [43]. In contrast, Nacef in Algiers and Toure in Dakar reported frequencies of 26.3% and 20.8%, respectively [47, 26].

Regarding hemoptysis, 13.04% (n= 9) of patients presented it, which aligns with the results from Nacef (10.5%). Conversely, Bouytse and Loudadsi reported higher rates at 46% and 26%, respectively [43,37]. Lower rates were noted by Kaltenbach (7.14%) [48].

In our study, 53.62% of patients experienced chest pain, similar to the 58.3% reported by Toure [26] in Dakar, while Loudadsi [48] documented 18% among his patients.

Pulmonary tuberculosis in elderly individuals is primarily characterized by the prominence of general signs. The most frequent sign observed in our study was an altered general condition, which was present in 91.3% of cases. This finding aligns with similar studies conducted by Loudadsi (93%) [37], Majdoub (92.6%) [40], and Gargouri (80.8%) [31].

Altered general condition (AGC), in practice, serves as a crucial indicator of various underlying organic pathologies, particularly in the elderly population. These pathologies can range from acute infectious conditions to chronic medical disorders.

Fever was present in 76.81% of our patients. Contrariwise, Majdoub [40] in Tunisia reported a frequency of less than 53.6%. Similar trends were provided by Nacef [47] in Algeria and Tidjani [32] in Togo, with frequencies of 13.5% and 19.5% respectively.

Physical examination highlights the relative contrast between the importance of functional symptomatology and the discretion of physical signs. Pulmonary condensation was present in 75.36% of patients, which aligns with the results reported by Toure in Dakar (73.1%) [26]. Furthermore, Toure [26] also found undernutrition in 63.6% of patients, whereas in our study, it was only 21.74%. Weight loss is one of the classic signs of tuberculosis. Malnutrition is a risk factor for this disease and can be caused by several exogenous factors (such as inadequate intake, anorexia, and lack of financial resources) as well as endogenous factors (such as inflammation, …). Moreover, failure to regain weight during treatment may be associated with relapse and therapeutic failure.

- **Microbiology**

AFB testing of sputum by bacilloscopy and/or GeneXpert was positive in 92.75% of patients. Marniche [49] and Neffati [41] in Tunisia and Toure et al [26] reported comparable results, with 100%, 75%, and 91.6% respectively. These results are proof of the progress made with the use of new, more reliable, and accessible methods such as GeneXpert.
By contrast, Yacoub [36] in Tunisia found 14% of positive bacilloscopies. This low smear positivity rate in elderly patients may be due to difficulties in obtaining adequate sputum due to their inability to produce sputum, or by producing lower quality sputum containing mainly saliva [38]. To optimize the results of bascilloscopy, it is necessary to integrate other diagnostic techniques such as bronchoscopy, sputum culture, and Xpert MTB/RIF when evaluating elderly patients with tuberculosis [42].

- **Rifampicin resistance:**

In our study, rifampicin resistance was noted in 7.25% of patients, a result similar to that of B. Hauer [51] in Germany, who described resistance in 6.5% of patients. Among our patients who developed rifampicin resistance, one had positive retroviral serology, while the other four were experiencing a second episode of pulmonary TB. This resistance could therefore be explained by the reactivation of an infection acquired in the distant past. Drug resistance is the result of poor therapeutic management, with treatment for primary tuberculosis interrupted prematurely and/or inadequate therapy introduced, including direct or indirect monotherapy, and the ability of *Mycobacterium tuberculosis* to mutate spontaneously and continuously.

- **Medical Imaging**

In our study, an alveolar syndrome was found in 69.75% of patients, a result comparable to that of Assaf [50] with 70%. Contrariwise, Neffati [41] and Toure [26] in Dakar had reported 42.7% and 37.5% respectively in their studies. However, 7.25% (n = 5) of our patients presented with interstitial syndrome, while Toure [26] reported a higher rate of 16.7% in his study.
In our study, cavitary images were found in 49.27% (n = 34) of patients. This frequency was lower than the results asserted by Toure [26] in Dakar (66.7%) and higher than those of Bouytse [43] in Rabat (30%) and Assaf [50] in Algeria (13%).

- **Evolutionary aspects**

In our study, the average hospital stay was 17 days. Toure [26] in Dakar noted a duration of 35 days. Complications were noted in our study in 31.88% (n=22) of patients. Maddeh [39] and Marniche [49] in Tunisia reported a higher rate of complications, with 78% and 72% respectively. The occurrence of complications is attributable not only to ageing, but also to the problems of managing the geriatric population, which often suffers from many comorbidities. The latter is often associated with increased social and psychological vulnerability, loss of autonomy, altered quality of life, depression, and sensory impairment, complicating the practice of healthcare personnel, with repercussions on the organization of care due to diagnostic difficulties, polymedication, risks associated with multiple prescribers, increased use of care and higher costs.

- **Outcome:**

The outcome was favorable for 69.56% of patients, with a mortality rate of 30.43%. In the literature, the death rate varied between studies. Bouytse [43] in Rabat recorded

25% deaths; Toure [26] 29.2%; Fettal et al [35] 23.6% and de Kaltenbach et al [48] 22%. However, Majdoub [40] reported a mortality rate of 7%. Elsewhere, Marniche [49] and Nacef [47] recorded a lower rate of 2% and 3.3% respectively. The high mortality must be interpreted with caution, as mortality increases with age. This high death rate observed among elderly tuberculosis patients may be due to increased levels of comorbidities (diabetes mellitus, hypertension, and cardiovascular disease...), malnutrition but also excessive alcohol consumption, smoking to combat boredom, isolation, and masked depression...

The factors significantly associated with lethality were dyspnea (p=0.03) and chest pain (p=0.04). Dyspnea is a well-known clinical parameter indicating advanced disease and the severity of lung damage. Dyspnea in the elderly is a medical emergency at the crossroads of several specialties (pulmonology, geriatrics, emergency resuscitation, cardiology). Other clinical factors have been described in the literature.

The paraclinical signs of poor prognosis were anemia (p=0.01), hyperleukocytosis (p=0.02), and hyponatremia (p=0.04). Ekono [52] in Yaoundé and Kourbatova [53] noted that anemia was a significant predictor of death. Anemia, which has multifactorial mechanisms of an infectious, nutritional, and inflammatory nature, is often a poor prognostic factor for many infectious diseases. In Russia, R Singla [54] mentioned hyponatremia as a mortality-related factor. Other factors have also been described in the literature [53, 55-59].

5. Conclusion

The elderly are particularly exposed to tuberculosis, due to physiological aging of the immune system, polypathology, and immunodepression (neoplasia, chemotherapy, corticotherapy, undernutrition, etc.). In addition, elderly subjects, often carriers of quiescent BK, are particularly at risk of endogenous tuberculosis reinfection, attributable to immune imbalance. This study showed that tuberculosis in the elderly occurred more frequently in men. Dyspnea, chest pain, anemia, hyperleukocytosis, and hyponatremia were predictors of death.

Consent

Confidentiality was ensured by the identification numbers used to ensure anonymity. Patients will not be identified in scientific publications and/or in various presentations related to this study.

Ethical approval

The Head of the Pneumo-Physiology Department approved the protocol and authorized the survey. Confidentiality and anonymity were respected.

LIMITS OF STUDY

The constraints of this study were related to:

- Inadequate archiving of patient medical records, resulting in the unavailability of some records.
- Incomplete data in several medical records, making them difficult to use.
- Failure to perform sputum cultures, which would have enabled us to determine the type of mycobacteria and perform antibiograms.

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