OPEN ACCESS

Saudi Journal of Medicine
Abbreviated Key Title: Saudi J Med
ISSN 2518-3389 (Print) | ISSN 2518-3397 (Online)
Scholars Middle East Publishers, Dubai, United Arab Emirates
Journal homepage: https://saudijournals.com

Original Research Article

Zpidemiological, Diagnostic, Therapeutic, and Evolutionary Characteristics of Post Tuberculous Respiratory Sequelae in a Reference Service in Thiès (Senegal)

Mama Ndao[1]*, Maamoune Laghouane[2], El Hadji Mamadou Ndiaye[2]

[1]Pulmonology Department, Tivaoune Hospital/UFR Santé Thiès, Senegal
[2]Pulmonology Department, Saint Jean de Dieu Hospital, Thiès, Senegal

DOI: https://doi.org/10.36348/sjm.2026.v11i01.001 | **Received:** 29.10.2025 | **Accepted:** 23.12.2025 | **Published:** 05.01.2026

***Corresponding Author:** Mama Ndao
Pulmonology Department, Tivaoune Hospital/UFR Santé Thiès, Senegal

Abstract

Introduction: Tuberculosis remains a major public health problem in Senegal and, despite effective treatment, it frequently leaves respiratory sequelae that cause chronic morbidity. This study was conducted to determine the epidemiological, diagnostic, therapeutic and evolutionary aspects of post-tuberculosis respiratory sequelae. ***Methodology:*** Retrospective and descriptive study including patients with post-tuberculosis respiratory sequelae followed at the Saint-Jean de-Dieu Hospital in Thiès (Senegal). ***Results:*** Over a period of 63 months, we identified 133 cases of post-tuberculosis respiratory sequelae. There was a male predominance (67%) with a sex ratio of 2 and an average age of 51 years. In 83% of cases, a single episode of tuberculosis was sufficient to cause respiratory sequelae. Radiological abnormalities were mainly located in the lung parenchyma (61%) and were bilateral in 86% of cases. The main types of abnormalities were fibrous condensation blocks (15.03%), followed by emphysema (14.2%), pulmonary calcifications (13.53%) and fibrosis (9.02%). The complications found mainly included aspergillosis graft (32%) and chronic pulmonary heart disease (CPC) (32%). ***Conclusion:*** Post tuberculosis pulmonary sequelae remain common in vulnerable patients, with persistent symptoms and varied lesions. The lack of targeted functional assessment calls for more comprehensive prospective studies.

Keywords: respiratory sequelae, tuberculosis, PTLD.

INTRODUCTION

Tuberculosis (TB) remains one of the leading causes of infectious morbidity and mortality worldwide. According to recent reports from the World Health Organisation (WHO), more than 10 million new cases and nearly 1.3 million deaths were recorded in 2022, demonstrating the persistent burden of this disease despite the effectiveness of anti-tuberculosis treatment [1,2]. The majority of this burden is concentrated in Southeast Asia and sub-Saharan Africa, and Senegal is no exception, despite ongoing efforts to strengthen screening, treatment and follow up of patients. Beyond active tuberculosis, a long-neglected issue is emerging: post-tuberculosis lung disease, defined as any chronic respiratory condition, symptomatic or not, attributable wholly or partly to a history of treated and declared cured pulmonary tuberculosis [3]. The growing importance attached to this entity stems from recent data showing that microbiological cure does not necessarily mean the absence of sequelae or long-term morbidity. Post tuberculosis respiratory sequelae are a major public health problem, particularly in countries with high endemicity. International studies indicate that between 30% and 50% of patients treated for pulmonary tuberculosis have persistent functional or radiological abnormalities several years after the end of treatment [4,5]. These sequelae, which include pulmonary fibrosis, post-infectious bronchiectasis and bronchial stenosis, have a significant impact on patients' quality of life and functional capacity. They are characterised by considerable clinical, functional and radiological heterogeneity. The most common manifestations are dyspnoea, chronic cough, sputum production and, in some cases, haemoptysis. Paraclinically, chest X rays and, above all, computed tomography (CT) scans show fibrotic sequelae, architectural distortions or bronchiectasis, while spirometry may reveal obstructive, restrictive or mixed syndromes, sometimes associated with a decrease in carbon monoxide diffusion (DLCO) [6]. The management of these respiratory sequelae is a real challenge. The lack of systematic follow-up after

recovery leads to delayed diagnosis, while the complexity of the sequelae requires a multidisciplinary approach involving pulmonology, imaging, endoscopy, respiratory rehabilitation and, in some cases, thoracic surgery. Recent recommendations from the European Respiratory Society (ERS) and the Union emphasise the importance of early screening for sequelae, respiratory rehabilitation, management of bronchiectasis and long-term monitoring [7]. However, limited access to specialised examinations and respiratory rehabilitation, the lack of standardised protocols and the cost of treatment are all obstacles to optimal management in highly endemic settings. It is in this context that this study was conducted with the aim of investigating the prevalence of chronic symptoms, changes in lung function and the impact on quality of life in this particular population of patients with chest sequelae of tuberculosis. The objectives of this study were to determine the sociodemographic and diagnostic characteristics, therapeutic outcomes and futurs prospects of patients with post-tuberculosis respiratory sequelae.

MATERIALS AND METHODS

We conducted a retrospective, descriptive study in the pulmonology department of Saint-Jean de-Dieu Hospital in Thiès (Senegal). The study period ran from 1 January 2019 to 31 March 2024. We included patients with a documented history of treated and declared cured pulmonary tuberculosis who had a chest CT scan showing sequelae consistent with post-tuberculosis lung disease (PTLD) and who were followed up or consulted in the department during the study period and whose medical records contained the necessary clinical and radiological data. Confirmation of post-tuberculous lung disease was based on the presence of at least one characteristic radiological sequela on chest CT scan: fibrosis, architectural distortion, post infectious bronchiectasis, bronchial stenosis, pulmonary calcifications, cavitation, post tuberculous emphysema or residual cavities. We did not include patients with active tuberculosis at the time of the scan, those with previous pulmonary lesions unrelated to TB (interstitial lung disease, post-infectious sequelae not related to TB, COPD of non-post-TB origin), or incomplete records, particularly in the absence of CT scans. Exhaustive sampling was applied to all patients who strictly met the above criteria in order to minimise selection bias and ensure the reproducibility of the results. Data were extracted from medical records and CT reports using a standardised data collection form. The socio-demographic, diagnostic, therapeutic and evolutionary parameters to be studied were transcribed onto a pre-established collection form completed after consultation of the medical records. The data were entered using KOBOTOOLBOX version 2.02.12 and Microsoft Excel version 2016 software. Quantitative variables were described according to their position and dispersion parameters. Qualitative variables were expressed as proportions.

RESULTS

During our study, we analysed a total of 133 medical records from patients treated at Saint-Jean de Dieu Hospital. A male predominance (67%) was noted with a sex ratio of 2 ***(Fig. 1).*** The average age of patients was 51 years, ranging from 16 to 85 years, with a median age of 53 years. The most represented age group was 61 to 81 years, accounting for 36.4% of patients. More than half of the patients were married (71%), while single people accounted for 19% of cases. More than half of the patients were not in employment (53.03%), while farmers accounted for 10.61% and manual workers for 9.09%. The majority of patients (68%) had a low socioeconomic status, 26% had an average status, and 6% were considered to have a high status. The majority of patients (41%) had never attended school, 23% had completed middle school, 18% had completed primary school, 15% had completed secondary school, 2% had a university degree, and 1% had attended Koranic school. Toxic habits were present in 52.3% of patients, with 42% of them being smokers, 5% consuming cannabis, and a significant percentage consuming alcohol.

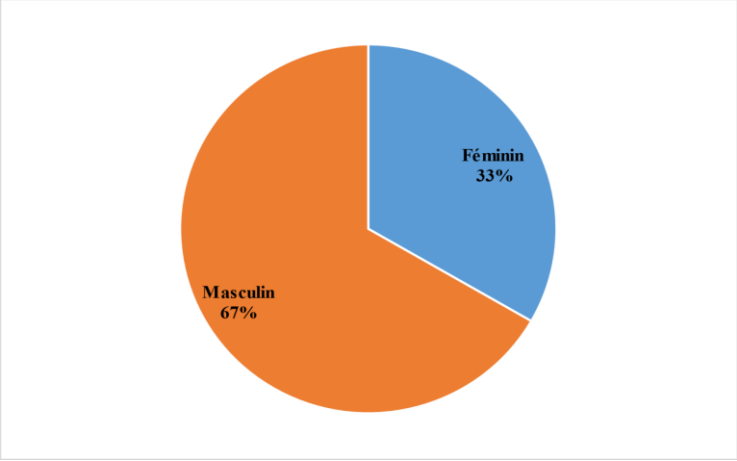

Figure 1: Distribution by gender

In addition, 32% of patients were exposed to harmful chemicals in their work environment. The majority of patients were being treated for pulmonary tuberculosis, with an average delay of 5 to 10 years between recovery from tuberculosis and diagnosis of sequelae. A single episode of tuberculosis was sufficient to cause sequelae in 83% of cases, while 20 patients had at least two episodes of pulmonary tuberculosis, all in the context of relapse. The most common functional sign was cough, observed in 90.2% of patients, followed by dyspnoea in 59.8% of cases. Among dyspnoeic patients, the majority (62%) were classified as stage 2. Sputum was reported by 55.3% of patients, while 31.1% of them had hemoptysis ***(Fig. 2).*** Among the latter, 56% had moderate haemoptysis and 42% had mild haemoptysis. The general condition of the patients was impaired, with asthenia observed in 55.3% of cases and weight loss in 47% of patients. In terms of nutritional status, only 11% of cases were cachectic. Among the physical respiratory signs, condensation syndrome predominated, observed in 59.8% of cases, followed by bronchial syndrome (15.9%) and cavitary syndrome (12.1%). As for extra-respiratory signs, tachycardia was the most frequently observed, with 5.3% of cases.

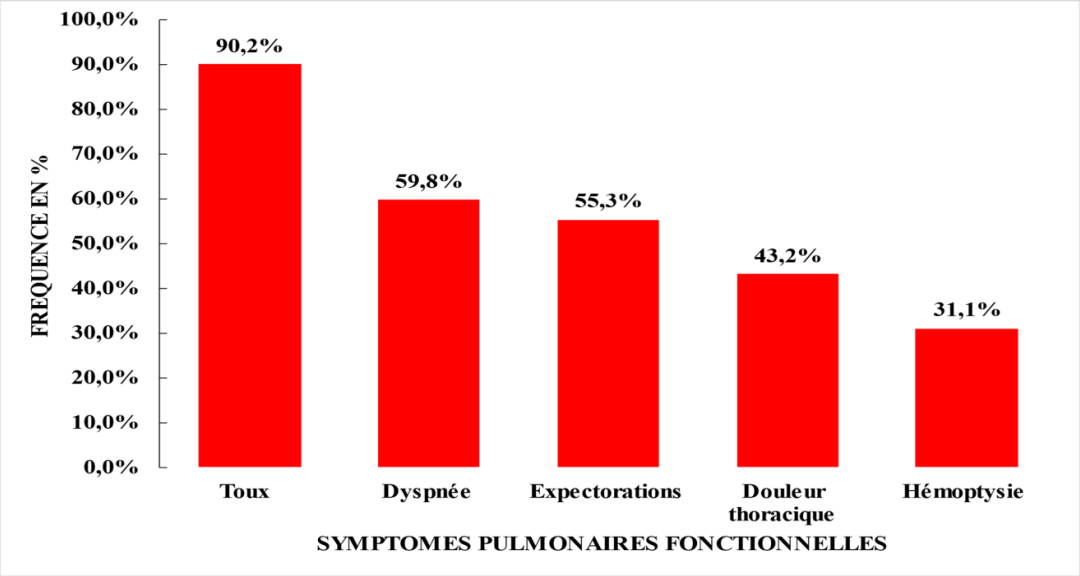

Figure 2: Distribution according to functional pulmonary symptoms.

Thanks to the chest CT scans performed on all patients, the respiratory sequelae of tuberculosis were mainly parenchymal, accounting for 61% of cases. They were localised in 37.1% of cases and bilateral in 86%. The right and left lungs were equally affected, with 40% in each case. In addition, 19% of patients had a destroyed lung. The various parenchymal sequelae mainly included post-TB bronchiectasis and architectural distortion (15.03%), para-cicatricial emphysema (14.2%), pulmonary calcifications (13.53%), pulmonary fibrosis (9.02%), large cavities (6.01%) and cavitation (2.25%), often associated with complications such as aspergillosis***. (Table I).*** Bronchial involvement was mainly dominated by bronchiectasis, found in 30.8% of cases, and tracheal bayonet deformity in 9 patients (6.7%). In contrast, pleural involvement was noted in only 1.5% of cases.

Table I: Distribution according to the type of lung parenchyma involvement.

Parenchymal involvement	Number	Size N=133	%
Post-TB DDB and architectural distortion	20	133	15,03%
Post-tuberculous emphysema	19	133	14,2%
Pulmonary calcifications	18	133	13,53%
Pulmonary fibrosis	12	133	9,02%
Large residual cavities	8	133	6,01%
Cavity	3	133	2,25%

With regard to pulmonary complications, aspergillosis was predominant, observed in 32% of patients, followed by bacterial superinfection of cavities (23.5%), empyema (19.7%) and haemoptysis due to DDB (7.6%). ***(Fig. 3).*** With regard to cardiovascular complications, 32% of patients had chronic pulmonary heart disease, 12% had pulmonary arterial hypertension, and 6% had decompensated right heart failure. A total of 79 patients (60%) received medical treatment with antibiotics, 24% received corticosteroid therapy, and 7% underwent respiratory physiotherapy. Surgical treatment was indicated in 13 patients (10%). However, a significant proportion of patients (63%) were lost to follow-up, while 37% were still alive at the time of the

study. Among these living patients, 40% had a poor quality of life, 51% had an average quality of life, and only 7% had a good quality of life.

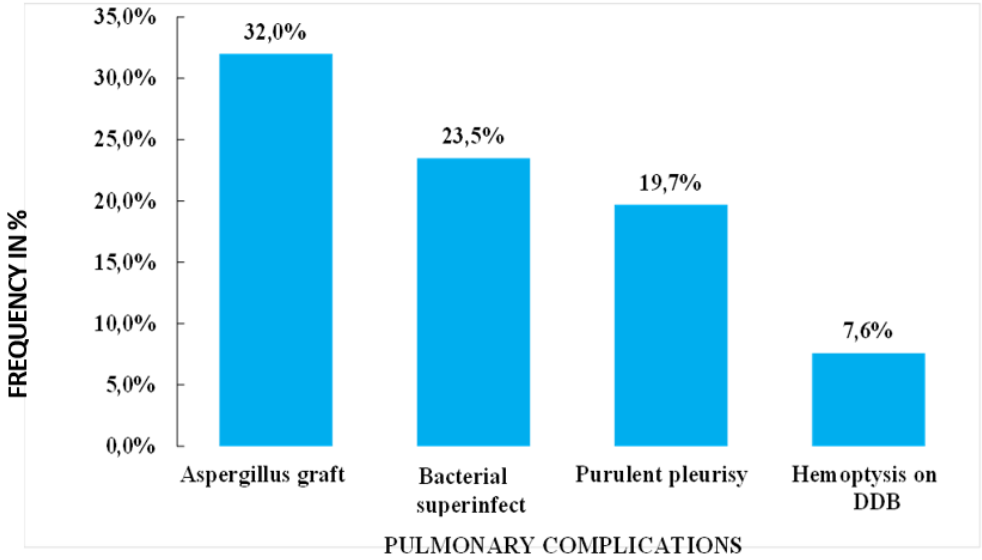

Figure 3: Distribution according to pulmonary complications

DISCUSSION

The literature on the chest sequelae of tuberculosis in Africa remains remarkably poor, despite the scale of the problem in the region. Few studies have been conducted specifically on the long-term effects of pulmonary tuberculosis, particularly chest sequelae, in African contexts. Developing countries, which are the most affected, have few resources to conduct large-scale studies, which are nevertheless essential to assess the extent of this condition, which is likely to pose a public health problem in the medium to long term [6]. We collected 133 cases over a period of 63 months, compared with Agai *et al.,* [8], who collected 40 cases over a period of 24 months in the radiology and pulmonology departments of the Hassan II University Hospital in Fez. In addition, Bah Ousmane et al. [9] reported 103 cases over a 12-month period, observed during consultations or hospitalisation in the pneumophtisiology department of the Ignace Deen National Hospital of the Conakry University Hospital. This could explain why the pulmonology department at Saint-Jean de Dieu Hospital is one of the most sought-after facilities for the treatment of post-pulmonary tuberculosis respiratory sequelae. We noted a male predominance with a frequency of 67% and a sex ratio of 2. These results corroborate the data in the literature, which shows that this male predominance appears to be consistent. In most societies, men make up the majority of the working population, which often exposes them to certain diseases that are transmitted between humans. The National Employment Survey in Senegal (ENES), conducted in 2015, showed that the activity rate was 65.2% at the national level. According to the survey, seven out of ten men of working age were economically active [10]. The average age in our study was 51 ± 6.73 years. These results are comparable to those found by M.F. Cissè [11], H. Haddaoui (12) and I. Badri (13), with respective averages of 49.08, 60.5 and 62 years, respectively. This higher frequency of sequelae in men and in the working-age population could have a very significant social (family) and economic impact in terms of the suffering caused by a chronic condition, which can be very debilitating and often requires lifelong treatment, in the main breadwinner. The majority of our patients (68%) belonged to a low socioeconomic status, a result comparable to that reported by M.F. Cissé *et al.,* [11], who also identified a low socioeconomic status in 70% of cases. These observations corroborate the data in the literature, which indicate that tuberculosis has historically been associated with poverty. Low socioeconomic status is a major risk factor for tuberculosis and its consequences. People living in poverty often have limited access to quality health infrastructure and essential medicines. Due to their precarious financial situation, they are less likely to consult a doctor when the first symptoms appear. This situation is exacerbated by the indirect costs of care, such as transport to health centres, loss of income during treatment, or additional costs associated with specialised examinations. Low levels of education (41%) may be linked to low socioeconomic status, which is a recognised risk factor for TB, as people are unaware of the scale of the problem and its manifestations. Another reason lies in the behaviour of people living in extreme poverty, most of whom have lost any instinct to seek hospital care and tend to turn to traditional healers instead. Nearly half of our patients (42%) were smokers, which is consistent with the results of other studies. For example, N. Gueza [14] reported a rate of 40.74%, while M.F. Cissé [11] found a prevalence of 52.3% and C.

Smoking can have a significant impact on respiratory health by causing emphysematous lesions that can weaken the lungs, exposing the patient to infections such as tuberculosis, which can leave significant respiratory sequelae, including chronic respiratory failure. A single episode of tuberculosis was sufficient to cause parenchymal sequelae in 83% of cases. This is due to late diagnosis of the disease, which leaves very significant sequelae despite good therapeutic compliance over 6 months. The main complaints of patients were dominated by cough (90.2%), particularly cough with whitish sputum (39.7%), followed by dyspnoea (59.8%), particularly in stages 2 and 3, with 62% and 34% respectively. The majority of patients presented with an altered general condition, with asthenia in 55.3% of cases, weight loss in 47% and cachexia in 11% of cases. These results are consistent with studies conducted by AGAÏ *et al.,* [8], where complaints were also dominated by cough (95%), dyspnoea (80%) and haemoptysis (62.5%). They also noted that the majority of their patients presented with an altered general condition, with asthenia in 55% of cases and weight loss in 50%. On chest CT scans, the lesions were mainly located in the lung parenchyma in 61% of cases, affecting the respiratory tract (RT) in 37.5% of cases and the pleura in 1.5% of cases. These results are comparable to those of the AGAI study [8], which observed 57.5% of parenchymal sequelae and 7.5% of pleural sequelae. Furthermore, these data are consistent with those of M.F. Cissè *et al.,* [11], who reported 89.8% of cases of parenchymal sequelae. It should be noted that parenchymal lung damage is predominant, which is mainly explained by pulmonary tuberculosis infections that primarily affect the lung parenchyma, targeting the alveoli and bronchioles, which leads to acute and chronic inflammation. This inflammation can cause local lesions, tissue destruction and cavity formation. In our series, the lesions were bilateral in 86% of cases, with equal involvement of the right and left lungs (40% each), localised in 37.1% of cases, and one lung destroyed in 19% of cases. In comparison, Jougon. J *et al.,* [15] observed a predominance on the right (51.13%) compared to the left (36.36%), while M.F. Cissé *et al.,* [11] reported parenchymal involvement in 96.6% of cases, mainly bilateral (73.3%) and diffuse (85.8%). To avoid the respiratory sequelae of tuberculosis, awareness campaigns on TB must be stepped up so that the disease can be diagnosed early and a complete course of anti-tuberculosis treatment lasting several months can be followed to completely eliminate the tuberculosis infection in the body [16]. In our study, pulmonary complications were dominated by aspergillosis, accounting for 32% of cases, residual cavities with superinfection observed in 23.5% of cases, empyema in 19.7% of cases, and finally haemoptysis associated with bronchial dilatation (BD) in 7.6% of cases. It was noted that 32% of patients developed CPC, while 12% had pulmonary arterial hypertension (PAH) and 6% had right heart failure. These major complications are classic and have a poor prognosis, worsening the functional and even vital prognosis and thus altering the quality of life of these patients with permanent dyspnoea. Due to their often irreversible and disabling nature, they sometimes require long-term oxygen therapy, which is very difficult to access in our developing countries [17]. Although sequelae such as fibrosis or bronchiectasis are mainly structural, antibiotic treatment may be indicated in cases of bacterial superinfections, which are common in this context. Their administration is particularly recommended in the presence of clinical signs such as increased coughing and a change in the colour of sputum (indicating purulence), impaired lung function or episodes of haemoptysis. Surgery has become an increasingly important therapeutic option for treating the sequelae of tuberculosis, due to the severity and impact of these sequelae on patients' health. It aims to promote healing of tuberculosis sequelae by removing pleuropulmonary lesions, restoring satisfactory respiratory function and reintegrating the patient into their daily activities. Respiratory physiotherapy plays an essential role in the medical management of the thoracic sequelae of tuberculosis, particularly in improving respiratory function and preventing pulmonary complications. It promotes the drainage of bronchial secretions, reduces the risk of secondary infections and optimises the effectiveness of respirato. Bronchial clearance techniques, muscle strengthening exercises and assisted ventilation manoeuvres help to improve lung capacity and patients' quality of life. In addition, respiratory physiotherapy helps to maintain good chest mobility and prevent muscle contractures, thus promoting better adaptation to physical exertion. In cases of respiratory disability, it is particularly important to emphasise the imperative of stopping smoking, flu vaccination and pneumococcal vaccination. A minimum amount of daily physical activity, where possible in the form of at least 30 minutes of walking per day or at least 2 hours per week, has been shown to have an impact on improving survival. Due to its location, the Thiès region is an additional obstacle for many patients, who struggle to travel to consult their doctor and continue their treatment on a regular basis, whether for consultations, treatments, or regular follow-ups. This financial insecurity sometimes forces them to abandon their treatment due to a lack of sufficient resources. Furthermore, indirect costs, such as transport expenses and time off work, amplify these obstacles. These economic constraints, combined with the lack of appropriate support mechanisms, contribute directly to an increase in the number of patients who are lost to follow-up, thereby compromising their prognosis and quality of life.

CONCLUSION

This study, based on the analysis of 133 cases, shows that post-tuberculosis pulmonary sequelae remain common several years after recovery, primarily affecting elderly patients with low socioeconomic status who are exposed to risk factors such as smoking or occupational exposure. The clinical manifestations were dominated by

cough, dyspnoea and haemoptysis, while the scan lesions were mainly parenchymal and fibrocavitary, often associated with infectious or cardiovascular complications. Although the study highlights an impaired quality of life in a significant proportion of patients, it did not specifically assess respiratory function or quality of life according to the type of sequelae. Prospective studies incorporating functional and multidimensional assessment are needed to better characterise the impact of post tuberculosis sequelae.

REFERENCES

1. World Health Organization. Global tuberculosis report 2023 Geneva: World Health Organization; from https: https://www.who.int/publications/i/item/9789240061729
2. World Health Organization. Global tuberculosis report 2025 [Internet]. Geneva: World Health Nov Organization; 2025 [cited 23 Nov. 2025]. Available https://www.who.int/publications/i/item/9789240116924 world Health Organization
3. Migliori GB, Marx FM, Ambrosino N, et al. Clinical standards for the assessment, management and rehabilitation of post-TB lung disease. Int J Tuberc Lung Dis. 2021;25(10):797–813.
4. Meghji J, Lesosky M, Joekes E, et al. Patient outcomes associated with post-tuberculosis lung damage in Malawi: a prospective cohort study. Thorax. 2020;75(3):269–278.
5. Byrne AL, Marais BJ, Mitnick CD, Lecca L, Marks GB. Tuberculosis and chronic respiratory disease: a systematic review. Int J Infect Dis. 2015;32:138–146.
6. Allwood BW, van der Zalm MM, Amaral AFS, et al. Post-Tuberculosis Lung Health: Perspectives from the First International Symposium. Int J Tuberc Lung Dis. 2020;24(8):820–828.
7. El Houari A, Nechad W, Kouara S, et al. Radiological and clinical profile of tuberculosis sequelae. Revue des Maladies Respiratoires. 2012;29, 200–201.
8. AGAÏ KODJO JB, EFALOU P et al. Imaging of sequelae and complications of chest tuberculosis in 40 cases at the HASSAN II University Hospital in Fez (Morocco). J Afr Imag Méd 2022; 14(4):268-274
9. Aminata BO, Diallo BD, Balde AA, et al. Radiological aspects of sequelae of thoracic tuberculosis in adults at the pneumophtisiology department of Ignace Deen National Hospital. African Journal of Medical Imaging. 2020;12(2):100-106.
10. Republic of Senegal, National Agency for Statistics and Demography (ANSD). Gender analysis of existing databases 2016. http://www.ansd.sn/ressources/publications/rapport
11. M.F. Cissè, Y. D. Kane, I. Abesossolo, FBR Mbaye, K. Thiam, N.O. Touré. Evolution and outcome of patients with sequelae of chest tuberculosis. Rev. Mal. Resp. Jan. 2020; vol. 12: 168-169.
12. Haddaoui H, Zahraoui R, Soualhi M, Bourkadi JE. Etiological and evolutionary profile of patients with chronic respiratory failure. Revue des Maladies Respiratoires. Jan. 2018;35:A244-A245
13. Badri I, Feki W, Kchaou A, Moussa N, Bahloul N, Ketata W, et al. Etiological and evolutionary profile of patients with chronic respiratory failure on OLD. Revue des Maladies Respiratoires. Jan 2016;33:A180-A181
14. Gueza N, Bouhedda M, Lellou S. Living with the sequelae of tuberculosis. Rev Mal Respir. 2018;35: A181.
15. Jougon J , Dubois G, Velly JF. Pneumonectomy techniques. EMC (Elsevier SAS, Paris), Surgical Techniques-Thorax; 2005:42: 300-305.
16. Smith NH, Hewinson RG, Kremer K, Brosch R, Gordon SV. Myths and misconceptions: the origin and evolution of Mycobacterium tuberculosis. Nat RevMicrobiol. 2009; 7(7):537-544
17. Ndiaye M, Ndir M, Hane AA, Michel FB, Bousquet J. Application of the WHO "chronic respiratory diseases" programme in sub-Saharan Africa: issues in Senegal. Rev Mal Respir. 1 June 2004;21(3, Part 1):479-491.