

# Late Diagnosis and Treatment of Pulmonary Tuberculosis in Ziguinchor, Southern region of Senegal

## Abstract:

**Background:** Untreated smear-positive pulmonary tuberculosis constitutes the main source of transmission of the disease in the community.

**Aims:** The aim of our study was to determine the diagnosis delays of smear-positive pulmonary tuberculosis in adults and to identify the factors associated with the diagnosis delay in Ziguinchor, Senegal.

**Methodology:** This is a prospective descriptive and analytical study carried out from January 1, 2019 to December 31, 2022, in cases of pulmonary tuberculosis whose diagnosis was confirmed by the identification of AFB in sputum after Ziehl Nielsen staining and/or detection of Mycobacterium tuberculosis by Genexpert. Delay was defined as a diagnosis confirmed after 36 days. Logistic regression was performed to determine factors associated with diagnosis delay.

**Results:** A total of 141 patients were included. They had an average age of 40 years  $\pm$  16 years, (16 years - 86 years). The peak age group was 16-30 years (34.04%). The sex ratio (M/F) was 1.8. The main characteristics of the patients were: a low level of education (34.8%), work in the informal sector (70.2%) and smoking (25.5%). More than half of the patients (78.44%) had their home less than 5 km from the anti-tuberculosis dispensing center. The patients' initial symptoms were dominated by cough (90.0%), fever (78%) and weight loss (59.6%). The traditional healer was the first source of care in 40.4%, followed by the health post (37.7%), the health center (16%) and regional hospitals (5.8%). HIV serology was positive in 13.5% of cases. The average time between the beginning of symptoms and the tuberculosis diagnosis was  $36 \pm 9.22$  days (15 - 58 days). The median time to treatment initiation was  $1.8 \pm 1.6$  days (1 - 6 days). A diagnosis delay was noted in 53.19%. In multivariate analysis with linear regression, age  $> 50$  years ( $p = 0.021$ ), use of herbal medicine ( $p = 0.036$ ) and monthly income  $< 58$  USD ( $p = 0.039$ ) were the factors associated with late diagnosis of tuberculosis.

**Conclusion:** The diagnostic delay in smear-positive tuberculosis cases is significant in our context. To shorten this mean delay period, it is necessary to both strengthen the professional abilities and skills of caregivers in the health posts and involve after training the traditional healers in the screening and sensitizing process of the population

**Key words:** pulmonary tuberculosis – delay in diagnosis – Southern region, Senegal.

## Introduction

Tuberculosis is an infectious disease caused by a bacterium of the Mycobacterium tuberculosis complex which is transmitted mainly by the respiratory route. It is a major public health priority in endemic areas, particularly in developing countries in sub-Saharan Africa. A global estimate of more than 10 million cases of MTB with 1.30 million deaths (95% UI: 1.18–1.43 million) was recorded in 2022[1]. The COVID-19 pandemic has reduced

access to diagnosis and treatment of tuberculosis, increasing the number of undiagnosed, untreated cases and deaths due to tuberculosis during this period. In Senegal, the National Tuberculosis Control Program (PNT) established in 1985 has the general objective of reducing morbidity, mortality and transmission of tuberculosis in accordance with the MDGs. Screening and anti-tuberculosis drugs were made available and free at health facilities in all regions. In spite of the global and national efforts in the fight against tuberculosis, the statistics of the infection remain worrisome. In Senegal, the incidence of the disease is estimated at 117 per 100,000 inhabitants with 17 deaths per 100,000 inhabitants in 2020 [2].

Diagnosis delay, in addition to being a serious factor at an individual level, facilitates the transmission of the disease within the community [3,4]. It is a key indicator of the quality of tuberculosis control programs. Presently, there is paucity of such data available. Therefore, the objective of the study is to determine the prevalence of delay in diagnosis and its associated factors in Ziguinchor, Senegal

### **Methodology:**

This is a prospective, descriptive and analytical study carried out in the infectious diseases department of La Paix hospital in Ziguinchor between January 2019 and December 2022. We included all cases of pulmonary tuberculosis whose diagnosis was confirmed by AFB and/or genexpert sputum during hospitalization or outpatient's consultation. Data collection was carried out directly from patients, from the hospitalization or consultation register and medical records. The variables studied concerned both the patient (sociodemographic data, medical history, etc.) and the disease (clinical signs, date and results of the various examinations and consultations carried out, date of diagnosis). The following indicators were noted :

- The patient delay or consultation delay is the time between the beginning of symptoms and the first consultation in a health facility.
- The diagnosis delay is the time elapsed between the date of the first medical consultation and the date of the diagnosis confirmation of smear-positive tuberculosis.
- The treatment initiation time corresponds to the time elapsed between the date of diagnosis of the disease and the date of initiation of anti-tuberculosis treatment.

- The overall treatment time is the period between the start of symptoms and the start of treatment.

Currently, there is no consensus on an acceptable diagnosis delay for tuberculosis. It is commonly accepted that for effective control of the disease, the patient-related delay should not exceed 2 to 3 weeks and the total treatment time 3 to 4 weeks. We considered a total treatment time of more than 36 days as a diagnostic delay.

The delays were separated into early diagnosis delay and late diagnosis delay according to the median of each of the delays for the performance of a multivariate analysis by logistic regression. Chi square tests and relative risk with its 95% confidence intervals were used for statistical comparisons, setting the threshold for statistical significance at  $p < 0.05$ .

### **Results:**

A total of 141 new patients with smear-positive pulmonary tuberculosis were included in the study. The sex ratio was 1.8 with a male predominance (65.25%). The average age of the patients was 40 years  $\pm$  16 years [16 years– 86 years]. The age group of 16-30 years was the most represented (34.04%) as shown in Table 1. The majority of patients were married (48.2%), illiterate (34.8%) and worked in the informal sector (70.2%). Consumption of tobacco, alcohol and narcotics was noted as 25.5%, 13.5% and 0.7% respectively. A greater number of the patients (78.44%) had their home less than 5 km from the anti-tuberculosis dispensing center and 55.35% of them had to walk or take public transport to reach the DOTS center. The first point of care, 41,1% consulted a traditional healer, 37.6% consulted a health post, 15,6% a health center and 5.6% regional hospitals. HIV serology was positive in 13.5% of cases. The initial symptoms of tuberculosis observed by the patients were dominated by cough (90.0%), fever (78%) and weight loss (59.6%) as shown in Figure 1.

The median diagnosis time was 37 days (IQR: 31–42 days). . The median time to treatment initiation was 1 day (IQR: 1–3 days). The overall median time between the onset of symptoms and treatment was 39 days (IQR: 32 – 44 days). The prevalence of diagnosis delay was 53.19%. In multivariate analysis, age  $>$  50 years ( $p = 0.021$ ), use of herbal medicine ( $p = 0.036$ ) and monthly income  $<$ 58 USD ( $p = 0,039$ ) were the factors significantly associated with late diagnosis of tuberculosis. Gender, alcohol consumption or education level were not associated factors (Table 2).

### **Discussion:**

The study was carried out to determine the prevalence of delay in diagnosis and treatment of tuberculosis with the associated factors in Ziguinchor, Senegal.

The majority of patients were males in a ratio of 1,8. The male predominance has been found in several African studies [5,6]. It is quite similar to the results of a study carried out in Tunisia[7]. A similarly higher prevalence of tuberculosis among men has also been reported in other studies in Asia[8,9]. The higher risk of tuberculosis in men may be due to greater exposure to risk factors, such as smoking, excessive alcohol consumption, poor diet and poor hygiene. They are also more likely to be exposed to poor living conditions, such as overcrowding, which promotes the spread of disease. Other studies have suggested that male sex hormones, such as testosterone, may influence the body's immune response to tuberculosis infection. Generally, adult females mount stronger innate and adaptive immune responses than males.

The average age of the population studied was  $40 \pm 16$  years and the age group of 16-30 years was the most represented with 34.04%, which is also similar to the general trend in other African countries such as Ethiopia and Uganda[5,6]. Elsewhere, other studies in Asia and Brazil have found similar results [8,10]. Nearly half (48.2%) of our patients were married and lived in rural areas (48.3%). These results are similar to those of a study carried out in Pakistan where 60.2% were married, 62.5% coming from rural areas [11]. Two Ethiopian studies noted similar results with an association between residence in a rural area and increased patient delay [12, 13]. Several other studies have also shown the role of rurality in the diagnosis delay of tuberculosis [12, 13]. Such a situation can be explained by greater precariousness of rural populations, the difficulty of access to health centers and/or by insufficient geographic health coverage. Clinically, the most common signs were cough (90%), fever (78%), and weight loss (59.6%). We included only smear-positive pulmonary tuberculosis cases. Our results are similar to those of a study carried out in Morocco[14] which found cough (96.4%) as the main signs, followed by fever (83.1%) and weight loss (80.3%).

Patients' recourse to traditional healers at first was found in 41,1% of cases. Our observations were close to those of Brouwer [15][16] who reported that 37% of patients followed a treatment from a traditional healer before resorting to conventional medical care. This tendency to rely on medicinal plants is due on one hand to the fact that the Senegalese population is mainly agricultural and rural, with a high poverty and illiteracy threshold. On the other hand, few people can access basic health services due to the non-existence of health centers in the most remote areas. It should also be noted that in the Senegalese culture, tree (garab in Wolof) literally means remedy [16].

The total median time from onset of symptoms to tuberculosis diagnosis and initiation of treatment was 39 days. The first and third quartiles corresponded to

32 and 44 days, respectively. This result is comparable to those of several other studies carried out in Angola [17], Malaysia[18] and Uganda [19] showing a median delay of 4 weeks. On the other hand, this delay in our study is less than the 52.56 days, 10 weeks and 4 months for tuberculosis patients respectively found in Tunisia[7], South Africa [20][21] and Ghana [21]. It is also lower than the times reported in studies conducted in Italy (median time of 66 days [22], Norway (63 days) [23], and France (68 days) [24].

The median time to diagnosis was close to those reported in several studies (35 days) in Pakistan and China (31 days) [25].

The highest median delays were observed in Addis Ababa, Ethiopia (78.2 days)[26] and India (75.71 days) [27]. These differences in diagnosis time depend on various factors, including access to health care facilities, quality of TB control programs, public awareness of TB issues, social, economic and cultural status of the country.

The median time to treatment initiation was  $1.8 \pm 1.6$  with a minimum of one day and a maximum of six days. Delays in initiation of anti-TB treatment can lead to nosocomial transmission of TB and can prolong the total length of hospitalization, impacting the cost of care for patients [20].

### **Factors associated with significant diagnosis delays**

In multivariate analysis, we identified three factors associated with this late delay in diagnosis of pulmonary tuberculosis: age > 50 years (0.021), use of herbal medicine (0.036), low monthly income < 35,000 FCFA (0.039).

Advanced age was significantly associated with the occurrence of delayed diagnosis of pulmonary tuberculosis. Patients aged 50 and over were 4 times more likely to experience a diagnosis delay of 36 days. This has been observed in other studies [11,28,29,30]. Indeed, elderly people have more frequently non-specific signs compared to young people and can therefore be treated for other medical illnesses initially.

Patients with low monthly income were twice as likely to experience a diagnosis delay in our study. Several studies have highlighted the relation between low income/poverty and diagnosis delays [11,28,31,32,33]. Tuberculosis is considered as a mark of social insecurity due to the precarious living conditions of people affected by it. Low-income patients often struggle to reach health facilities or afford the costs of medical screening and treatment for

TB. And have less access to awareness and information means, leading to a delay in recognizing symptoms and seeking medical care.

Patients who used herbal medicine were three times more likely to experience a diagnosis delay of 36 days ( $P=0.036$ ). This has been observed in other studies [11,15,34]. This tendency to rely on medicinal plants is due on one hand to the fact that the Senegalese population is mainly agricultural and rural, with a poverty line and high illiteracy. On the other hand, few people can access basic health services due to the non-existence of health centers in the most remote areas. It should also be noted that in Senegalese culture, tree (garab in Wolof) literally means remedy [16]. This association should encourage the strengthening of collaboration between traditional healers and conventional healthcare services as has been proposed in South Africa [20].

**Conclusion:** The diagnosis delay in smear-positive tuberculosis cases favors the expansion of community tuberculosis. This study made it possible to identify some factors influencing its late diagnosis. In order to shorten the time, it takes to diagnose tuberculosis, measures aimed at reducing its incidence must place greater emphasis on these factors in hope to control this infectious disease.

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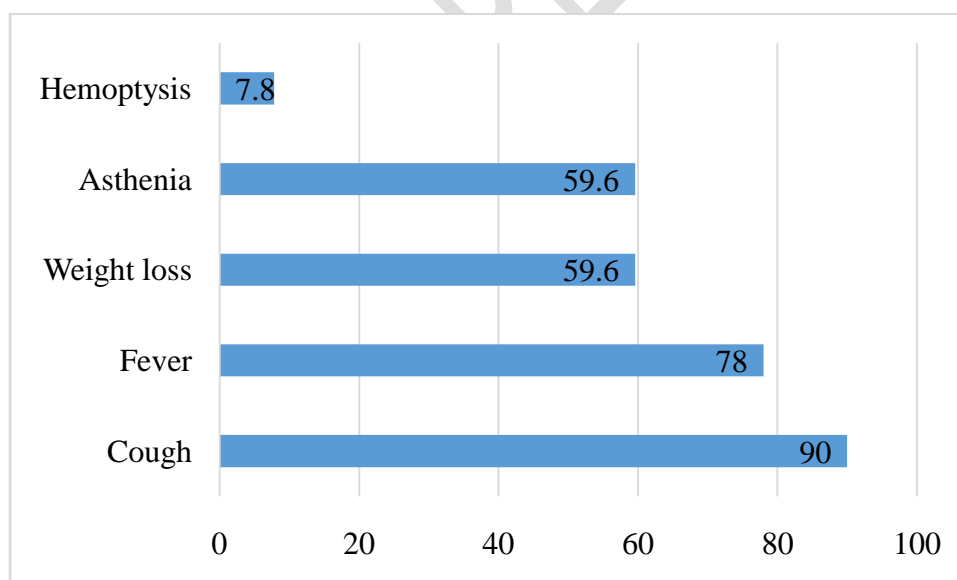
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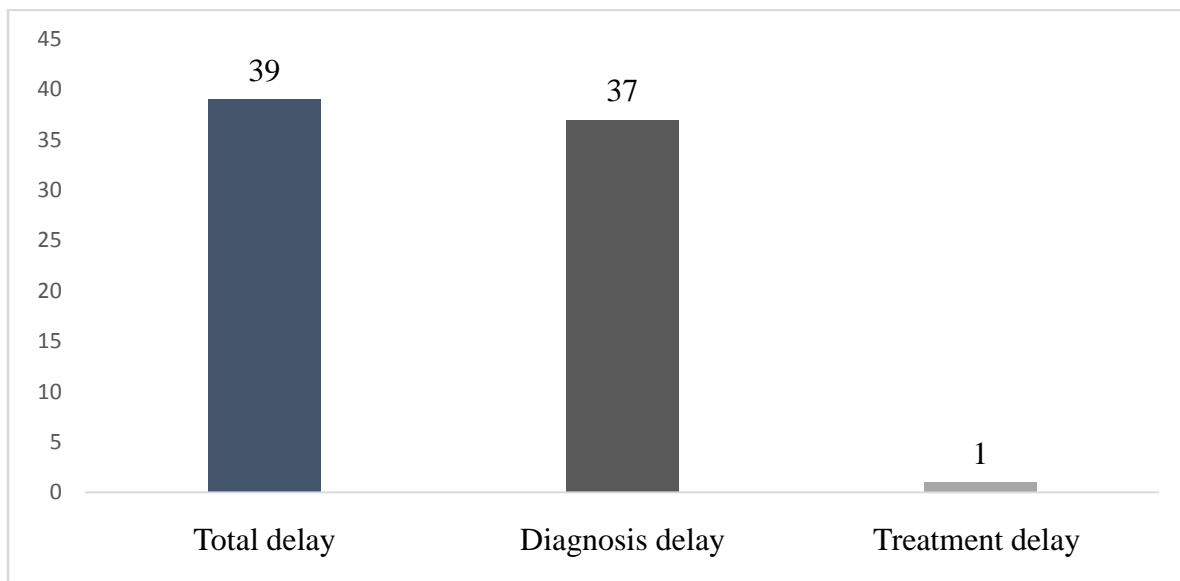
**Table 1:** Epidemiological characteristics of cases of bacilliferous tuberculosis followed at the Ziguinchor Peace Hospital, included in our study

<b>Paramètres</b>	<b>Effective</b>	<b>Percentage (%)</b>
<b>Sex</b>		
Femal	49	34,75
Male	92	65,25
<b>Marital status</b>		
Single	55	39
Married	68	48,2
Widower	12	08,5
Divorce	06	04,3
<b>Level of study</b>		
Illiterate	49	34,8
Primary	34	24,8
Middle School-Secondary	44	31,2
University	13	09,2
<b>Professional sector</b>		
Formal sector	42	29,8
Informal sector	89	70,2

<b>Age groups (years)</b>		
16-30	48	34,04
31- 45	41	29,08
46- 60	36	25,53
> 60	16	11,35
<b>Distance between home and health facilities</b>		
Near (<5km)	73	51,8
Far (>5km)	68	48,2
<b>First site for seeking care</b>		
Traditional healers	58	41,1%
Healthposts	53	37,6%
Health center	22	15,6 %
Regional hospitals	08	5,6%



**Figure 1:** Circumstances of late discovery of smear-positive pulmonary tuberculosis at the Ziguinchor Peace Hospital



**Figure 2:** medians of total delay, diagnosis delay and delay to treatment

**Table 2:** Factors associated with delayed diagnosis of tuberculosis (36-day delay) in multivariate analysis

Associated factors	Odds Ratio	P> z	[95% Conf]
Alcoholconsumption	3,1	0.064	0,93- 10,3
Male gender	1,5	0.284	0,69 - 3,4
Use of herbalmedicine	3	0.036	1,07 - 8,56
Age >50 years	4	0.021	1,22 - 12,8
Low level of study	1,1	0.790	0,51 - 2,4
Income< 58 USD	2,2	0.039	1,04 - 4.64