Therapeutic itinerary and factors associated with late diagnosis of smear-positive 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. The objective of our work is 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 associatedwith diagnosis delay.

Results: A total of 141 patients were included. They had an average age of 40 years ± 16 years, (16 years - 86 years). The main 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 beginningof symptoms and the tuberculosis diagnosis was 36± 9.22 days (15 - 58 days). The median time to treatment initiation was 1.8± 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. The involvement of traditional healers and health posts in early treatment strategies is necessary to reduce diagnosis times.

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. An estimation of 10.6 million people developed the disease worldwide and 1.6 million died from it in 2020 [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. Despite all the efforts made in the fight against tuberculosis, the statistics remain worrying. The incidence of the disease is estimated at 117 per 100,000 inhabitants with 17 deaths per 100,000 inhabitants in 2020. In 2022, 14,688 cases were diagnosed, i.e. 5993 missing cases according to WHO estimations.

Diagnosis delay, in addition to being a serious factor at an individual level, facilitates the transmission of the disease within the community [2, 3]. For these reasons, it is a key indicator of the quality of tuberculosis control programs. To this date, there is little data available in Ziguinchoron the extent of this phenomenon. The objectives of this study are to determine the prevalence of diagnosis delay of tuberculosis in Ziguinchor and to determine the factors associated with this delay in our context.

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 retained:

- 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 M/F sex ratio was 1.8, with 65.25% men. The average age of the patients was 40 years ± 16 years 16 years– 86 years . The age group of 16-30 years was the most represented (34.04%) as shown in Table I. 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 respectively noted in 25.5%; 13.5 and 0.7% of cases. More than half 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. As their first recourse to 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. There was no association with gender, alcohol consumption or education level (Table II).

Discussion:

This study carried out at HopitalRégional De La Paix deZiguinchor aimed to understand the major delays in the diagnosis of tuberculosis and the initiation of anti-tuberculosis treatment in Ziguinchor.

In our study, the majority of patients were male with a ratio of 1.8. This male predominance has been found in several African studies [4, 5]. This is quite similar to the results of a study carried out in Tunisia [6]. A similarly higher prevalence of tuberculosis among men has also been reported in other studies in Asia [7, 8]. 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. Men tend to have a less effective immune response, which would facilitate the progression of the disease.

The average age of the population studied was 40 ±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 [4, 5]. Elsewhere, other studies in Asia and Brazil have found similar results [7, 9]. 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 Asia, in Nepal where two thirds of the people questioned were married, one third of the people coming from rural areas of Nepal [10]. Two Ethiopian studies noted similar results with an association between residence in a rural area and increased patient delay [11, 12]. Several other studies have also shown the role of rurality in the diagnosis delay of tuberculosis [11, 12]. Such a situation can

be explained by the 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 [15] 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 in41,1% of cases. Our observations were close to those of Brouwer [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 [17].

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 [18], Malaysia [19] and Uganda [20] 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 [6], South Africa [21] and Ghana [22]. It is also lower than the times reported in studies conducted in Italy (median time of 65 days [23], Norway (63 days) [24], and France (68 days) [25].

The median time to diagnosis was close to those reported in several studies (36 days in Italy, 33 days in Norway, China (31 days) [26] and the United States (35 days) [27].

The lowest median delays were observed in Pakistan (21 days) [28], France (25 days) and the highest median delays were observed in Tanzania (136 days) [29], the United Kingdom (126 days) [30] and Burkina Faso (120 days) [31].

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±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 [21,32].

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 [33, 34,35]. 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 [29, 33, 36, 37, 38]. 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 ([16, 39]. 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 [17]. This association should encourage the strengthening of collaboration between traditional healers and conventional healthcare services as has been proposed in South Africa [21].

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

Paramètres	**Effective**	**Percentage (%)**
Sex		
Femal	49	34,75
Male	92	65,25
Marital status		

Single	55	39
Married	68	48,2
Widower	12	08,5
Divorce	06	04,3
Level of study		
Illiterate	49	34,8
Primary	34	24,8
Middle School-Secondary	44	31,2
University	13	09,2
Professional sector		
Formalsector	42	29,8
Informal sector	89	70,2
Age groups (years)		
16-30	48	34,04
31- 45	41	29,08
46- 60	36	25,53
> 60	16	11,35
Distance between home and health facilities		
Near (<5km)	73	51,8
Far (>5km)	68	48,2
First site for seeking care		
Traditionalhealers	58	41,1%
Healthposts	53	37,6%
Health center	22	15,6 %
Regionalhospitals	08	5,6%

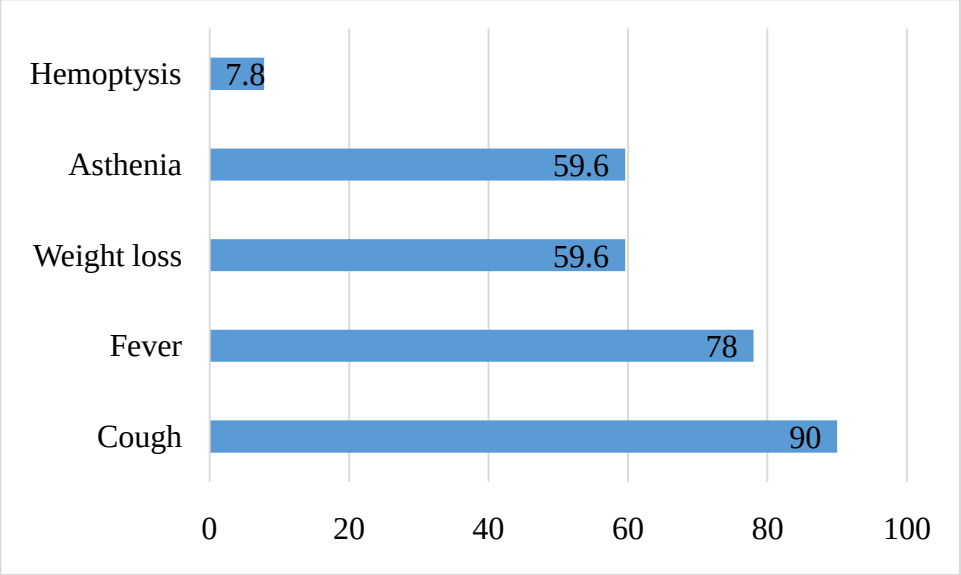

Figure 1: Circumstances of late discovery of smear-positive pulmonary tuberculosis at the Ziguinchor Peace Hospital

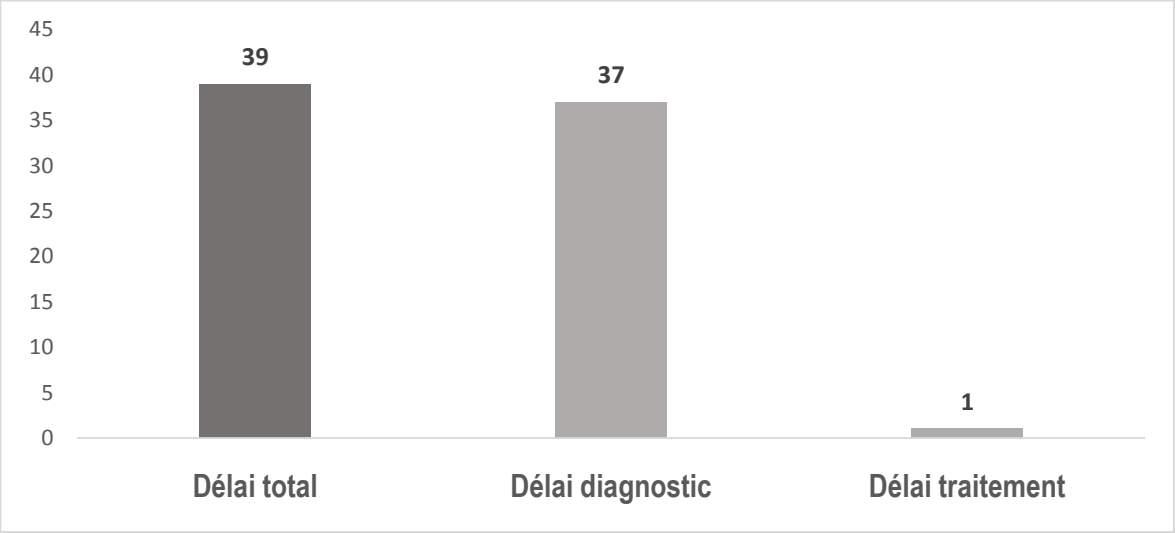

Figure 2: medians of total delay, diagnosisdelay and delay to treatment

Table II: 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 >50years	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