

Preplanned Studies

Patient Delay in the Diagnosis of Pulmonary Tuberculosis in the Elderly — China, 2015–2023

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Summary

What is already known about this topic?

Patient delay in seeking medical care for pulmonary tuberculosis (PTB), especially among elderly individuals with weakened immune systems and mild symptoms, not only slows their recovery but also increases the risk of tuberculosis spread because cases are not identified promptly.

What is added by this report?

In China, patient delays experienced by elderly PTB patients showed a modest decrease from 2015 to 2023. Notably, longer patient delays were observed among agricultural workers and those identified through passive case-finding methods. Furthermore, the patient delay in the western regions was longer than in the eastern and central regions.

What are the implications for public health practice?

The study underscores the imperative of accessible healthcare for the elderly to minimize patient delay in pulmonary tuberculosis diagnosis and treatment.

Pulmonary tuberculosis (PTB) remains a critical global health challenge, with a disproportionate burden on elderly populations. In 2021, 18% of global tuberculosis cases were among individuals aged 65 years and older (1). In China, elderly TB cases accounted for 25.9% of all TB diagnoses (2) and 61.6% of TB-related deaths in 2020 (3). The aging population in China is a pressing concern, with 13.5% of the population over 65 years old in 2020 (4). Despite national TB-control efforts that have succeeded in reducing overall TB cases, patient delay in TB diagnosis remains a persistent challenge. Patient delay is defined as more than 2 weeks from symptom onset to the first medical consultation (5). It is caused by patients failing to seek timely medical attention. Consequently, long delays in TB diagnosis not only increase community infectivity but can also lead to a more advanced disease state, potentially increasing complications and the risk of death (6). This study aims to investigate patient delay among the elderly in

China from 2015 to 2023 to provide insights to enhance TB detection and improve management strategies.

Data were extracted from the Tuberculosis Information Management System (TBIMS) within the Chinese Center for Disease Control and Prevention Information System for the study, which focused on PTB patients aged 65 years and older. Patients in the Xinjiang Production and Construction Corps were merged into Xinjiang. A total of 31 provincial-level administrative divisions (PLADs) were divided into eastern, central, and western regions based on the National Bureau of Statistics regional division criteria. The analysis included cases with accurate symptom onset dates and initial medical consultations. Illogical delay results (e.g., negative numbers) were excluded from the final analysis. Case-finding pathways were categorized as: 1) active, for those detected through active screening and health checkup; and 2) passive, for those detected through direct visits to designated TB institutes, referral, tracing, and recommendation by non-designated TB institutes. In this study, the median (M) and interquartile range (IQR) were used to summarize patient delay. The Kruskal–Wallis independent-samples median test was used to compare the medians of patient delay among different groups. The time trend of patient delay was tested using the Mann–Kendall method. All statistical analyses were performed using R software (version 4.0.3; R Core Team, Vienna, Austria). A two-sided *P* value of less than 0.05 was considered statistically significant.

A total of 1,559,849 elderly patients with PTB were included in the final analysis, representing 99.54% of reported elderly PTB cases between January 1, 2015, and December 31, 2023. The patients' sociodemographic, clinical, and management characteristics are presented in Table 1.

From 2015 to 2023, approximately 62% of elderly tuberculosis patients in China experienced delays in seeking care, with a median delay of 22 days (IQR 8–49). The 65–69 age group showed the longest median delays at 24 days (IQR 8–52), with shorter delays in older age groups. Farmers, herders, and

TABLE 1. Characteristics and timeliness of elderly pulmonary tuberculosis (PTB) patients registered in China, 2015–2023.

Group	Number of patients	Days Median (IQR)	P	Number of patient delay, n (%)	P
Total	1,559,849	22 (8, 49)	–	967,676 (62)	–
Sex			<0.0001		<0.0001
Male	1,096,171	22 (7, 48)		676,131 (62)	
Female	463,678	23 (8, 53)		290,840 (63)	
Age (years)			<0.0001		<0.0001
65–69	568,477	24 (8, 52)		358,960 (63)	
70–74	436,480	23 (8, 50)		272,677 (62)	
75–79	364,894	21 (7, 47)		223,407 (61)	
80–84	133,625	20 (7, 44)		80,013 (60)	
85 and over	56,373	19 (7, 41)		32,619 (58)	
Ethnicity					
Han	1,326,513	22 (7, 48)	<0.0001	814,751 (61)	<0.0001
Minorities	233,336	27 (9, 56)		152,925 (66)	
Occupation					
Farmers, herders, and fishermen	1,177,120	23 (8, 50)		741,473 (63)	
Retirees	200,970	19 (6, 44)	<0.0001	116,130 (58)	<0.0001
Houseworkers or unemployees	147,384	22 (7, 48)		89,668 (61)	
Others	34,375	21 (7, 48)		20,405 (59)	
Region					
Eastern	445,470	21 (7, 46)	<0.0001	270,992 (61)	<0.0001
Central	567,791	20 (7, 43)		339,011 (60)	
Western	546,588	27 (9, 60)		357,673 (65)	
Primary care institute			<0.0001		<0.0001
Designated institute	1,187,319	22 (7, 48)		726,404 (61)	
Non-designated institute	372,530	25 (9, 53)		241,272 (65)	
Case finding			<0.0001		<0.0001
Active screening	2,653	10 (1, 31)		1,113 (42)	
Health checkup	44,033	25 (8, 41)		27,798 (63)	
Passive case finding	1,513,163	22 (8, 50)		938,765 (62)	
Treatment history			<0.0001		0.0004
New	1,413,988	22 (8, 49)		878,454 (62)	
Retreated	145,861	22 (7, 52)		89,222 (61)	
Bacteriological results			<0.0001		<0.0001
Positive	786,362	22 (7, 52)		480,666 (61)	
Negative	704,452	23 (8, 48)		445,483 (63)	
Tuberculous pleurisy only	57,800	20 (8, 40)		35,329 (61)	
Unknown	11,235	18 (4, 47)		6,198 (55)	
Comorbidities			<0.0001		<0.0001
Yes	209,661	23 (8, 57)		131,578 (63)	
No	714,583	23 (8, 53)		449,400 (63)	
Unknown	635,605	21 (7, 44)		386,698 (61)	

Note: Patient delay means more than two weeks from symptom onset to the first medical consultation.

"–" indicates that no *P*-value was calculated for the totals.

Abbreviation: PTB=pulmonary tuberculosis.

fishermen faced the longest delays (23 days, IQR 8–50), while retirees had shorter delays (19 days, IQR 6–44). Geographically, patients in the western region experienced significantly longer delays (27 days, IQR 9–60) compared to those in the eastern (21 days, IQR 7–46) and central regions (20 days, IQR 7–43). Patients visiting non-designated medical institutions had longer delays (25 days, IQR 9–53) compared to those visiting designated institutions (22 days, IQR 7–48). Actively screened patients experienced fewer delays (10 days, IQR 1–31) than those detected through other means. However, over 60% of patients identified through ACF still experienced delays (Table 1).

The patient delay rate demonstrated an overall decreasing trend from 2015 to 2023, declining from 66% in 2015 to 60% in 2023 (Mann-Kendall trend P value=0.0049; Figure 1), despite a slight increase in 2022 and 2023. Specifically, the median (IQR) delay was 25 (9,54) days in 2015, followed by 25 (9,53) days, 24 (8,51) days, 24 (8,52) days, 23 (7,49) days, 21 (7,49) days, 20 (7,45) days, 20 (7,48) days, and 21 (7,45) days in subsequent years.

The geographical distribution of elderly tuberculosis patients in China revealed significant interprovincial variations in the number of registered patients, patients experiencing delays, the proportion of patient delays, and delay durations over the 9 years. Chongqing (77%), Jilin (72%), and Gansu (72%) had the highest

proportions of delays, while Beijing (41%) and Shanghai (44%) had the lowest. Chongqing (37 days, IQR 15–92) had the longest patient delay duration, while Beijing (8 days, IQR 0–33) and Shanghai (12 days, IQR 4–25) had the shortest (Table 2).

DISCUSSION

Elderly patients with PTB in China experience notable patient delays, with a slight decrease observed from 2015 to 2023. Patients who were farmers, herders, fishermen, and those who visited non-designated TB institutes experienced longer delays. Additionally, patients in western China experienced longer delays than those in the eastern and central regions. Patients identified through active case-finding (ACF) demonstrated shorter intervals before seeking medical care than those detected through passive case-finding (PCF). However, despite being identified through ACF, a significant proportion of patients still experience substantial delays before receiving necessary medical attention.

Although the proportion of patient delays among elderly patients has gradually decreased, these patients still experienced longer delays than the general population in China. From 2018 to 2022, patient delay for tuberculosis in China was 20 days (IQR 6–46) (7). However, delay among the elderly in China is relatively shorter, for instance, than the 29 days

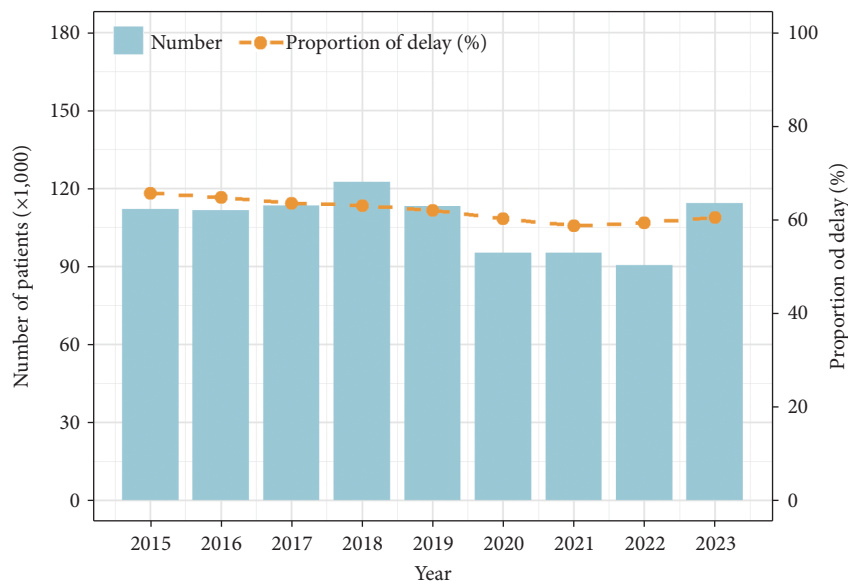


FIGURE 1. Registered patients with patient delay and proportions in China, 2015–2023.

Note: The horizontal coordinate represents the year of the patient's registration in the system (2015–2023). The left vertical coordinate signifies the count of patients experiencing delays, while the right vertical axis represents the patient delay rate. The bars symbolize the number of patients facing delays each year, and the polyline illustrates the annual fluctuation in the patient delay rate.

TABLE 2. Patient delays among elderly PTB patients across 31 PLADs in China, 2015–2023.

PLADs	Number of patients	Number of patients with delay	Proportion of patients with delay (%)	Days of delay Median (IQR)
Beijing	9,960	4,129	41	8 (0–33)
Tianjin	7,053	3,489	49	14 (3–36)
Hebei	59,412	35,164	59	19 (7–39)
Inner Mongolia	26,819	18,572	69	30 (11–64)
Shanxi	24,855	17,725	71	30 (12–62)
Liaoning	40,849	27,228	67	27 (10–48)
Jilin	17,995	13,035	72	30 (13–59)
Heilongjiang	41,370	27,873	67	27 (10–54)
Shanghai	12,717	5,581	44	12 (4–25)
Jiangsu	67,391	37,994	56	18 (6–35)
Zhejiang	60,518	34,108	56	18 (6–40)
Fujian	28,125	18,113	64	25 (9–61)
Shandong	61,409	42,817	70	30 (11–59)
Anhui	86,949	55,150	63	21 (9–38)
Jiangxi	71,190	40,088	56	17 (7–39)
Henan	104,624	51,111	49	14 (2–32)
Hubei	81,283	49,596	61	21 (8–45)
Hunan	139,525	84,433	61	21 (7–50)
Guangdong	88,019	55,825	63	25 (8–61)
Hainan	10,017	6,544	65	30 (9–61)
Guangxi	85,875	58,000	68	29 (10–66)
Chongqing	38,970	29,921	77	37 (15–92)
Sichuan	84,219	53,377	63	23 (8–54)
Guizhou	70,323	46,924	67	29 (10–69)
Yunnan	39,763	25,166	63	26 (9–61)
Xizang	3,523	2,371	67	26 (11–47)
Shaanxi	37,098	19,683	53	16 (4–41)
Gansu	25,281	18,260	72	30 (13–62)
Qinghai	7,051	3,739	53	16 (6–37)
Ningxia	7,704	4,851	63	24 (8–58)
Xinjiang	119,962	76,809	64	25 (8–45)

Note: Patient delay means from symptom onset to first seeking medical care.

Abbreviation: PTB=pulmonary tuberculosis; PLAD=provincial-level administrative division; IQR=interquartile range.

observed in Portugal for those aged 65 years and older (8). This shorter delay could be attributed to factors more prevalent in the elderly population, including mild symptoms, reduced mobility, and limited access to healthcare services.

Patients aged 65–69 years experience the longest and most frequent delays. Therefore, targeted interventions, including focused health education, should prioritize this age group to effectively address

patient delays. Occupational disparities, particularly among agricultural workers who face additional barriers to healthcare access due to remote living conditions and lower incomes, significantly contribute to delays. Additionally, patients seeking care at designated TB institutes have shorter delays than those at non-designated facilities, indicating greater TB awareness and a preference for specialized care when symptoms arise, which reduces overall delay times.

Furthermore, regional disparities are apparent, with patients in the western region experiencing longer delays. This may be attributed to a less developed healthcare infrastructure compared with the eastern and central regions. The World Health Organization (WHO) acknowledges older people as a priority group for active case-finding (9). This study and a previous investigation conducted in Yunnan Province, China, demonstrate that ACF can significantly reduce the time between symptom onset and healthcare access among elderly patients with TB (10). Despite these positive outcomes, the implementation of ACF to address patient delays in this population remains insufficient. These findings emphasize the crucial role of ACF in enhancing early detection, reducing delays, and mitigating the transmission of PTB (11). Although ACF effectively reduces patient delays, resource limitations hinder its implementation, particularly in the western region. Improving patients' awareness of TB symptoms and enhancing the diagnostic skills of primary healthcare workers are also crucial for reducing delays.

Regions like Chongqing, Jilin, and Gansu exhibited the highest proportions of patient delay, while Beijing and Shanghai, with their advanced medical infrastructure and higher health literacy, demonstrated shorter delays. In 2020, per capita health expenditures in Beijing and Shanghai exceeded 10,000 yuan, roughly double that in Chongqing, Jilin, and Gansu (12). These discrepancies in health investment likely influence health literacy, particularly among the elderly. This analysis highlights the impact of systemic healthcare initiatives and regional inequalities on patient delay patterns.

This study has several limitations. First, the reliance on surveillance data may impact the calculated average patient delay due to undetected cases. Second, the timing of symptom onset relies on patient self-reporting, which is subject to recall bias and may affect the precision of patient delay measurements. Third, our dataset lacked social and environmental factors, such as health service accessibility and income, which may have influenced our results. Future studies should investigate these potential risk factors in diverse settings for a more comprehensive understanding.

Delayed health seeking among elderly PTB patients in China remains a significant concern. Targeted strategies, such as active screening, are imperative, especially in regions with notable delays. Addressing this issue is crucial to mitigating the detrimental effects of patient delay and preventing TB transmission.

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