Original Article

Diagnostic Delay and its Predictors among Tuberculosis Patients in Kandahar, Afghanistan: A Cross-sectional Analytical Study

Hazratullah Bariz[1], Muhammad Haroon Stanikzai[1], Ghulam Mohayuddin Mudaser[2], Khalid Ahmad Stanikzai[3], Omid Dadras[4]

Departments of [1]Public Health and [2]Para-Clinic, Faculty of Medicine, Kandahar University, [3]Department of Clinic, Faculty of Medicine, Malalay Institute of Higher Education, Kandahar, Afghanistan, [4]Research Centre for Child Psychiatry, University of Turku, Turku, Finland

Abstract

Background: Diagnostic delay among tuberculosis (TB) patients leads to late anti-TB treatment initiation, which is associated with poor prognosis and increased TB transmission. Despite its recognized negative consequences, diagnostic delay among TB patients is common in developing countries, including Afghanistan, where evidence on its predictors is limited. We aimed to evaluate diagnostic delay and its predictors among newly diagnosed TB patients attending healthcare facilities in Kandahar, Afghanistan. **Methods:** A multicenter, cross-sectional study was conducted in Kandahar between February and May 2025. Newly diagnosed TB patients aged 18 years or older were randomly recruited from the TB care centers of six healthcare facilities. Delays in TB diagnosis encompassed both patient and healthcare system delays. The predictors of diagnostic delay were identified using a multivariable logistic regression model. **Results:** Patient and health system delays were noted in 44% and 59.4% of cases, respectively. Patients' low education level, extrapulmonary TB, longer distance to healthcare facility, and positive history of self-medication were significant predictors of diagnostic delays. **Conclusion:** Despite the well-established benefits of early TB diagnosis, this study revealed that delay in TB diagnosis is still a public health challenge in Kandahar province. Late presentation for TB care was a result of factors that relate to the patient's education, TB type, distance to healthcare facility, and history of self-medication. Therefore, focusing extra attention on these factors could potentially reduce diagnostic delays among TB patients in Afghanistan.

Keywords: Afghanistan, delays, diagnosis, predictors, tuberculosis

Submitted: 01-May-2025 **Revised:** 22-Jul-2025 **Accepted:** 23-Aug-2025 **Published:** 15-Sep-2025

Introduction

Survival and treatment outcomes in tuberculosis (TB) patients have improved over the past two decades.[1] However, there is still a high risk of mortality in TB patients due to delayed diagnosis.[2,3] Late TB diagnosis results in delayed treatment, poorer treatment outcomes, increased disease transmission, higher medical costs, and poor prognosis.[4,5] TB is highly prevalent in Afghanistan.[6] Moreover, Afghanistan faces numerous challenges in TB care, including high rates of treatment failure and TB-related mental health symptoms,[7,8] compounded by socioeconomic disparities, limited patient education, and inadequate healthcare infrastructure.[6,9,10]

Despite the detrimental effects of diagnostic delay among TB patients, it remains prevalent in many low- and middle-income countries (LMICs). For instance, a meta-analysis by Fetensa *et al*. reported a 50% prevalence of diagnostic delay among Ethiopian TB patients.[11] Similarly, another systematic review of 124 articles from TB high-burden countries found that the pooled median durations of patient delay and health system delay were 28 and 14 days, respectively.[12] Other studies in LMICs have also reported a high magnitude of diagnostic delay among TB patients, ranging from 27% to 65%.[13]

Access this article online

Quick Response Code:

Website: https://journals.lww.com/IJMY

DOI: 10.4103/ijmy.ijmy_91_25

Address for correspondence: Dr. Muhammad Haroon Stanikzai, Department of Public Health, Faculty of Medicine, Kandahar University, District #10, 3801, Kandahar, Afghanistan.
E-mail: haroonstanikzai1@gmail.com

ORCID:
Muhammad Haroon Stanikzai: https://orcid.org/0000-0003-2757-1965

How to cite this article: Bariz H, Stanikzai MH, Mudaser GM, Stanikzai KA, Dadras O. Diagnostic delay and its predictors among tuberculosis patients in Kandahar, Afghanistan: A cross-sectional analytical study. Int J Mycobacteriol 2025;14:232-8.

Research has attributed several factors to the heightened risk of diagnostic delay among TB patients in LMICs. For example, a mixed-methods systematic review found that poor TB knowledge, TB stigma, financial difficulties, poor access to healthcare, and lack of resources at healthcare facilities were associated with diagnostic delays among TB patients in high-burden countries.[12] Other factors such as female sex, rural residence, illiteracy, unemployment, and long distance to healthcare facilities have been linked with diagnostic delay among TB patients in the pertinent literature.[13]

Meanwhile, diagnostic delays among TB patients can be considerably reduced.[14,15] Several interventions have been implemented to reduce diagnostic delays among TB patients, including active case finding, rapid testing, patient benefit schemes, behavior change campaigns, health education, private-sector interventions, and capacity-building and skill development of healthcare professionals.[14,16] These interventions have shown varying influences across different settings.[14]

In Afghanistan, the context of diagnostic delay among TB patients has been underexplored,[17] particularly in the southern part of the country. Therefore, this study aims to evaluate diagnostic delays and their predictors among TB patients in Kandahar, Afghanistan. These findings will provide valuable information for evidence-based decision-making in TB control at the provincial and national levels.

Methods

Ethical Consideration

Ethical clearance for this study was obtained from the Research and Ethics Committee at the Faculty of Medicine, Kandahar University (Letter No. 115, dated January 10, 2025). The study strictly adhered to the ethical guidelines outlined in the Declaration of Helsinki.

Types of sampling and reasons for selection

We calculated our sample size using the formula commonly applied in cross-sectional studies for estimating proportions, based on a 50% prevalence rate of diagnostic delay (maximum estimate), a 95% confidence level, and a Z = 1.96. After adding a 10% nonresponse rate, a sample size of 422 TB patients was deemed adequate. Data from 441 patients were included in the analysis. We allocated the sample size proportionally to the TB patient load at each facility over the past 3 months.

Study design and settings

This cross-sectional study was conducted from February to May 2025 in six public healthcare facilities in Kandahar, Afghanistan: Kandahar TB Center, Mirwais Regional Hospital (MRH), Spin Boldak District Hospital, Allama Rashad Comprehensive Healthcare Facility (CHC), Zahari District CHC, and Panjwai District CHC. The healthcare facilities are being equipped to provide basic diagnostic and curative services to TB patients.

Inclusion criteria

Our study population consisted of TB patients attending the TB care centers of the abovementioned healthcare facilities. Based on our inclusion criteria, we only recruited newly diagnosed TB patients aged 18 years and above.

Exclusion criteria

Severely ill and nonconsenting TB patients were excluded from the study.

One hundred and ten patients were recruited from MRH, followed by the Kandahar TB Center (65), Spin Boldak District Hospital (52), Allama Rashad CHC (43), Zahari District CHC (39), and Panjwai District CHC (39). The patients were randomly recruited at each healthcare facility using the lottery method.

Study variables

The outcome variable was diagnostic delay among TB patients, which consisted of patient delay, health system delay, and total delay. We assumed the patient was delayed if they visited a professional health provider more than 30 days after the onset of TB symptoms.[18,19] Health system delay was confirmed if a TB diagnosis was confirmed more than 4 days after the patient presented to a professional health provider.[18,19] Total delay was equal to the sum of patient and health system delays. We recorded delay periods in days.

The independent variables examined were sociodemographic characteristics and clinical factors. The sociodemographic factors included age, sex, education level, residential area (urban vs. rural), marital status, employment status, household size, monthly income, and distance to healthcare facility. Clinical variables comprised TB type, family history of TB, knowledge of TB, self-perceived severity, self-medication, current smoking, TB-related stigma, and history of depression symptoms were also included as independent factors of interest. Depression symptoms were assessed by the patient's self-reported dichotomized questions with a yes or no response to "Did you experience any depression symptoms during disease?"

Data collection

We used a paper-based, structured, and pretested questionnaire to collect data. A 30-min face-to-face interview was conducted with newly diagnosed TB patients at their exit in a private room. Female interviewers interviewed female patients. We checked all questionnaires for completeness, consistency, and accuracy.

Patient consent statement

We obtained verbal informed consent from all participants in the study.

Statistical analysis

To assess the distribution of sociodemographic characteristics and clinical factors of patients, descriptive statistics were provided using frequency and percentage. To examine the likelihood of patient and health system delays across the

categories of explanatory variables, bivariate and multivariable binary logistic regression models were used. To determine the inclusion of explanatory variables in the multivariable analysis, we included the explanatory variable in the multivariable regression analysis if it had $P < 0.25$ for all categories of the explanatory variable from the bivariate model. All data analyses were performed using STATA version 17 (StataCorp LLC, College Station, Texas, USA.).

Results

Demographic characteristics

In total, we enrolled 441 newly diagnosed TB patients in the study. Among them, 148 (33.6%) were aged >50 years, more than half (53.7%) were females, two-thirds (63.9%) had no formal education, 272 (61.7%) were urban residents, and the majority (70.5%) were married. Moreover, patients were most likely to live in households with more than five members (83.2%) and had to travel more than 1 h to reach the nearest health facility (54.6%). Regarding income, 239 (54.2%) had a monthly household income exceeding 10,000 Afghanis [Table 1].

Clinical characteristics

Of all the patients, 287 (65.1%) had pulmonary TB, one-third (33.1%) had a family history of TB, and 283 (64.2%) had poor knowledge of TB. The majority of patients had TB-related stigma (67.6%) and depression symptoms (89.1%). About half of the patients (49.7%) reported self-medication before a diagnosis was made. Details on the first health facility contacted by patients are presented in Table 2.

Prevalence of patient, health system, and diagnostic delays among tuberculosis patients

Figure 1 shows that the median (mean) patient delay was 30.1 (68.9) days, with 44% of patients experiencing prolonged patient delay. Moreover, the median (mean) health system delay was 10.3 (27.4) days, with 59.4% of patients experiencing prolonged health system delay [Figure 1].

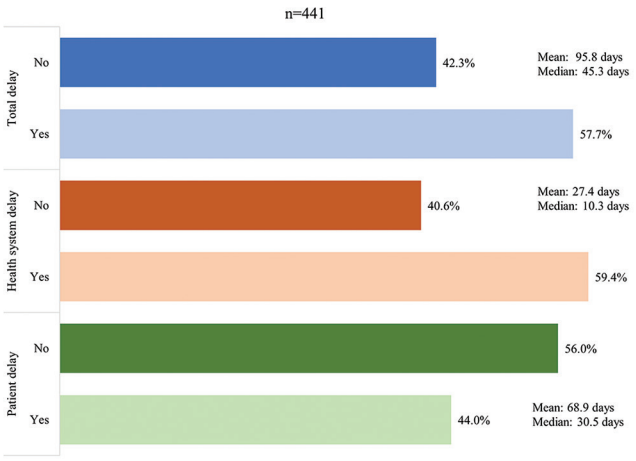

Figure 1: Prevalence of patient, health system, and total delays

Factors associated with patient delay among tuberculosis patients

The likelihood of patient delay was higher in patients with no formal education (adjusted odds ratio [AOR]: 1.60, 95% confidence interval [CI]: 1.02–2.49), in extrapulmonary TB patients (AOR: 1.82, 95% CI: 1.19–2.77), patients with longer distance to the nearest health facility (AOR: 1.56, 95% CI: 1.05–2.33), and those with a history of self-medication (AOR: 2.27, 95% CI: 1.51–3.40) [Table 3].

Factors associated with health system delay among tuberculosis patients

Similarly, the patient's education level, type of TB, time to reach the nearest health facility, and history of self-medication were predictors of health system delay.

Table 1: Sociodemographic characteristics of the study participants (*n*=441)

Variables	Frequency, *n* (%)
Age	
18–20	38 (8.6)
21–30	110 (24.9)
31–40	78 (17.7)
41–50	67 (15.2)
>50	148 (33.6)
Sex	
Male	204 (46.3)
Female	237 (53.7)
Residence	
Urban	169 (38.3)
Rural	272 (61.7)
Marital status	
Single	94 (21.3)
Married	311 (70.5)
Widowed/divorced	36 (8.2)
Educational status	
No formal education	282 (63.9)
Religious	72 (16.3)
Primary	50 (11.3)
Secondary	9 (2.0)
High school graduate	20 (4.5)
Higher studies	8 (1.8)
Employment status	
Public employed	41 (9.3)
Private employed	37 (8.4)
Homemaker	182 (41.3)
Unemployed	181 (41.0)
Household members	
2–5	74 (16.8)
>5	367 (83.2)
Distance to a health facility (h)	
≤1	200 (45.4)
>1	241 (54.6)
Monthly household income (Afghanis)	
5000–10,000	202 (45.8)
>10,000	239 (54.2)

Table 2: Clinical and other related characteristics (*n*=441)

Variables	Frequency, *n* (%)
Type of TB	
Pulmonary TB	287 (65.1)
Extrapulmonary TB	154 (34.9)
Self-perceived severity	
Mild	55 (12.5)
Moderate	145 (32.9)
Severe	241 (54.6)
TB awareness	
Yes	158 (35.8)
No	283 (64.2)
Family history of TB	
Yes	146 (33.1)
No	295 (66.9)
TB-related stigma	
Yes	298 (67.6)
No	143 (32.4)
Depression symptoms	
Yes	393 (89.1)
No	48 (10.9)
Currently smoking	
Yes	62 (14.1)
No	379 (85.9)
Type of health facility first contacted	
Public hospital/clinic	164 (37.2)
Private hospital/clinic	114 (25.8)
Pharmacy	163 (41.0)
Self-medication	
Yes	219 (49.7)
No	222 (50.3)

TB: Tuberculosis

The crude and AOR for health system delay are presented in Table 4.

Discussion

The aim of this was to evaluate diagnostic delay and its predictors among TB patients in Kandahar, Afghanistan. We found that 44% and 59.4% of patients experienced prolonged delays within the patient and health system, respectively. In addition, we found that patients' low education level, longer distance to health facilities, extrapulmonary TB, and self-medication were significantly associated with diagnostic delay among TB patients.

We found that 44% of participants had prolonged patient delay, with a median (mean) of 30.1 (68.9) days. This finding aligns with earlier studies conducted in India (44.6%)[15] and southern Ethiopia (median: 30 days).[20] However, our finding is higher than studies conducted in Ethiopia (median: 20–24 days)[21,22] and China (median: 16.8 days).[23] No recent study has assessed diagnostic delay among TB patients in Afghanistan. Nonetheless, the previous studies have shown poor TB knowledge and high TB-related stigma among Afghan TB patients.[7,24] These findings, together, underscore a critical need for integrated policy action, embedding TB awareness into the community's literacy and vocational programs, and mobilizing community health workers in active TB case finding.

We also observed an alarming magnitude (59.4%) of health system delay in the current study. The previous studies have also documented prolonged health system delays among TB patients in LMICs.[14,25,26] Limited resources, a shortage of the health workforce, and poor capacity among healthcare professionals are some of the reasons linked to health system delays in LMICs.[14] Earlier studies have shown that TB care faces significant challenges in Afghanistan, particularly in the postconflict scenario.[6,8,27] Considering the negative health consequences and higher medical and nonmedical costs associated with late TB diagnosis, there is an urgent need for resource allocation, the provision of rapid diagnostic tools, and the capacity-building and skill development of healthcare professionals in Afghanistan.

Education has long been considered a significant predictor of optimal healthcare utilization. We also observed that patients with no formal education encountered substantial delays in TB diagnosis. This finding is in agreement with studies conducted in Indonesia[28] and Ethiopia.[22] Previous studies in Afghanistan have also revealed high prevalence of TB-related stigma, depression symptoms, and nonadherence to anti-TB medications among patients with no formal education.[8,9] Taking these findings together, TB programs and policies should prioritize individuals with limited education in Afghanistan.

We found that TB patients who had to travel more than 1 h to reach the nearest health facility were more likely to experience both patient and health system delays than their counterparts. Studies in LMICs have revealed that longer distance to healthcare facilities contributes to late diagnosis, nonadherence to medication, higher medical and nonmedical costs, and poor prognosis.[29] In Afghanistan, earlier research has shown that a longer distance is a contributing factor to poor healthcare utilization.[30,31] Therefore, policymakers should prioritize expanding access to decentralized TB diagnostic and treatment services in remote areas to reduce both patient and health system delays.

Extrapulmonary TB has been identified as a risk factor for delayed TB diagnosis.[32,33] Similarly, we found that the odds of patient and health system delays were greater in patients diagnosed with extrapulmonary TB compared to those diagnosed with pulmonary TB. This finding is echoed in earlier studies conducted in LMICs.[19,22,34] No study has investigated diagnostic delay among extrapulmonary TB patients in Afghanistan. In addition, there is a limited focus on extrapulmonary TB in the Afghan health system.[6] These findings call for resource allocation and the capacity building of Afghan healthcare professionals in the diagnosis of extrapulmonary TB.

Finally, this study noted that self-medication is strongly associated with both patient and health system delays in

Table 3: Logistic regression analysis on results of patient delay; crude and adjusted odds ratios with 95% confidence interval

Variables	Categories	Patient delay		COR (95% CI)	*P*	AOR (95% CI)	*P*
		Yes	No				
Age	18–40	101	125	Reference	0.762	-	-
	>40	93	122	0.93 (0.64–1.37)			
Sex	Male	80	124	Reference	0.061	Reference	0.846
	Female	114	123	1.43 (0.98–2.09)		1.04 (0.68–1.59)	
Residence	Rural	120	152	Reference	0.946	-	-
	Urban	74	95	0.98 (0.67–1.45)			
Marital status	Currently married	138	173	Reference	0.80	-	-
	Currently unmarried	56	74	0.94 (0.62–1.43)			
Education status	Educated	55	104	Reference	0.003	Reference	0.038
	Uneducated	139	143	1.83 (1.23–2.74)		1.60 (1.02–2.49)	
Employment	Employed	35	43	Reference	0.86	–	–
	Unemployed	159	204	0.95 (0.58–1.56)			
Household size	2–5	35	43	Reference	0.86	–	–
	>5	159	204	0.95 (0.58–1.56)			
Distance to healthcare facility (h)	≤1	76	124	Reference	0.021	Reference	0.026
	>1	118	123	1.56 (1.06–2.29)		1.56 (1.05–2.33)	
Monthly income	5000–10,000	85	117	Reference	0.45	–	–
	>10,000	109	130	0.86 (0.59–1.26)			
Type of TB	Pulmonary	114	173	Reference	0.014	Reference	0.005
	Extrapulmonary	80	74	1.64 (1.10–2.43)		1.82 (1.19–2.77)	
Self-perceived disease severity	Not severe	22	33	Reference	0.524	-	-
	Severe	172	214	1.20 (0.67–2.14)			
TB awareness	No	126	157	Reference	0.763	-	-
	Yes	68	90	0.94 (0.63–1.39)			
Family history of TB	No	132	163	Reference	0.650	-	-
	Yes	62	84	0.91 (0.61–1.36)			
TB-related stigma	No	65	78	Reference	0.668	-	-
	Yes	129	169	0.91 (0.61–1.36)			
Depression symptoms	No	18	30	Reference	0.337	-	-
	Yes	176	217	1.35 (0.72–2.50)			
Currently smoking	No	169	210	Reference	0.530	-	-
	Yes	25	37	0.84 (0.48–1.45)			
Self-medication	No	75	147	Reference	<0.001	Reference	<0.001
	Yes	119	147	2.33 (1.58–3.42)		2.27 (1.51–3.40)	

TB: Tuberculosis, COR: Crude odds ratio, AOR: Adjusted odds ratio, CI: Confidence interval

TB patients. Self-medication is known to be a significant barrier to timely TB diagnosis and results in various adverse consequences.[35] It also contributes to prediagnosis costs linked with TB.[36,37] Studies have also shown that prediagnosis costs comprise a significant portion of the total medical and nonmedical expenses associated with TB.[38] No study has reported on self-medication among Afghan TB patients. Therefore, the magnitude and predictors of self-medication among Afghan TB patients warrant further investigation.

Conclusion

Diagnostic delay among TB patients is an increasingly recognized basis for disease transmission and poor prognosis. About 44% and 59.4% of TB patients in our cohort had prolonged patient delay and health system delay, respectively. In addition, we found that patients' low education level, longer distance to the nearest health facility, extrapulmonary TB, and self-medication were significantly associated with diagnostic delay among TB patients. Therefore, focusing extra attention on these factors could potentially reduce diagnostic delays among TB patients in Afghanistan.

Outcomes of the study

About 44% and 59.4% of patients had prolonged patient delay and health system delay, respectively. Low education level, extrapulmonary TB, longer distance, and self-medication predicted diagnostic delay among TB patients. The high magnitude of diagnostic delays in the study area is a cause for concern and action.

Rationale of the study

No previous study has assessed diagnostic delay among TB patients in Southern Afghanistan. Therefore, this study aimed

Table 4: Logistic regression analysis on results of health system delay; crude and adjusted odds ratios with 95% confidence interval

Variables	Categories	Health system delay		COR (95% CI)	*P*	AOR (95% CI)	*P*
		Yes	No				
Age	18–40	140	86	Reference	0.266	-	-
	>40	122	93	0.80 (0.55–1.17)			
Sex	Male	114	90	Reference	0.162	Reference	0.960
	Female	148	89	1.31 (0.89–1.92)		0.96 (0.62–1.46)	
Residence	Rural	151	121	Reference	0.035	Reference	0.850
	Urban	111	58	1.53 (1.03–2.28)		1.03 (0.67–1.60)	
Marital status	Currently married	182	129	Reference	0.556	-	-
	Currently unmarried	80	50	1.13 (0.74–1.72)			
Education status	Educated	82	77	Reference	0.012	Reference	0.019
	Uneducated	180	102	1.65 (1.11–2.45)		1.70 (1.09–2.64)	
Employment	Employed	45	33	Reference	0.733	-	-
	Unemployed	217	146	1.09 (0.66–1.78)			
Household size	2–5	45	29	Reference	0.788	-	-
	>5	217	150	1.07 (0.64–1.78)			
Distance to healthcare facility (h)	≤1	112	88	Reference	0.184	Reference	0.022
	>1	150	91	1.29 (0.88–1.89)		1.71 (1.08–2.72)	
Monthly income	5000–10,000	120	82	Reference	0.99	-	-
	>10,000	142	97	1.00 (0.68–1.46)			
Type of TB	Pulmonary	153	134	Reference	<0.001	Reference	<0.001
	Extrapulmonary	109	45	2.12 (1.39–3.22)		2.23 (1.44–3.44)	
Self-perceived disease severity	Not severe	33	22	Reference	0.924	-	-
	Severe	229	157	0.97 (0.54–2.73)			
TB awareness	No	171	112	Reference	0.562	-	-
	Yes	91	67	0.89 (0.59–1.32)			
Family history of TB	No	177	118	Reference	0.720	-	-
	Yes	85	61	0.92 (0.62–1.39)			
TB-related stigma	No	83	60	Reference	0.685	-	-
	Yes	179	119	0.91 (0.61–1.36)			
Depression symptoms	No	28	20	Reference	0.872	-	-
	Yes	234	159	1.05 (0.57–1.93)			
Currently smoking	No	230	149	Reference	0.277	-	-
	Yes	32	30	0.69 (0.40–1.18)			
Self-medication	No	120	102	Reference	0.021	Reference	0.015
	Yes	142	77	1.56 (1.06–2.29)		1.66 (1.10–2.51)	

TB: Tuberculosis, COR: Crude odds ratio, AOR: Adjusted odds ratio, CI: Confidence interval

to evaluate diagnostic delays and their predictors among TB patients in Kandahar, Afghanistan. These findings will provide valuable information for evidence-based decision-making in TB control at the provincial and national levels.

Limitations of study

Although this study has provided important information about diagnostic delay among TB patients in Afghanistan, it has its limitations. First, the cross-sectional nature of the study makes it difficult to infer the temporal relationship between predictors and diagnostic delay among TB patients. Second, data on patient and health system delays were self-reported and are prone to information and recall biases. Third, the cutoff point for assessing diagnostic delay differs across studies; therefore, comparing diagnostic delays and their predictors considering various cutoff points seems formidable. Finally, our evaluation of predictors for diagnostic delay among TB patients was restricted to the information collected by the current study. Therefore, future studies include other important determinants, such as social and community support systems, media access, and doctor–patient communication, in their analyses.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

1. Yang H, Ruan X, Li W, Xiong J, Zheng Y. Global, regional, and national burden of tuberculosis and attributable risk factors for 204 countries and territories, 1990-2021: A systematic analysis for the Global Burden of diseases 2021 study. BMC Public Health

2024;24:3111.
2. Sebastian NM, Haveri SP, Nath AS. Delay in diagnosis of tuberculosis and related factors from a district in Kerala, India. Indian J Tuberc 2021;68:59-64.
3. Agarwal S, Chaurasia Z, Malik DK, Gupta R, Singh C, Jain S. The real burden of tuberculosis: Hidden cases diagnosed on autopsy at a tertiary care center of India. Int J Mycobacteriol 2022;11:47-50.
4. Liu JJ, Feng YP, Liu ZD, Guo J. Impact of delayed diagnosis and treatment on tuberculosis infection within families: A case report. Medicine (Baltimore) 2024;103:e37406.
5. Abderrahim S, Taright S. Risk factors for pulmonary tuberculosis in an urban area of Algeria. Int J Mycobacteriol 2025;14:48-55.
6. Stanikzai MH, Hashim-Wafa M. Tuberculosis (TB) care challenges in post-conflict settings: The case of Afghanistan. Indian J Tuberc 2022;69:383-4.
7. Stanikzai MH, Rahimy N, Baray AH, Anwary Z, Ahmad M, Sayam H. High stigma prevalence and associated factors among TB patients in Southern Afghanistan: A multi-center cross-sectional study. Indian J Tuberc 2024;71 Suppl 2:S203-7.
8. Stanikzai MH, Wafa MH, Baray AH, Rahimi AF, Sayam H. Anti-TB treatment non-adherence predictors: A multi-center cross-sectional study in Kandahar, Afghanistan. Indian J Tuberc 2024. doi: 10.1016/j.ijtb.2024.05.005.
9. Stanikzai MH, Ishaq N, Zafar MN, Baray AH, Anwary Z, Ahmad M, *et al.* Depression symptoms among Afghan TB patients: A multi-center study. Indian J Tuberc 2024;71 Suppl 2:S264-8.
10. Hamim A, Seddiq MK, Sayedi SM, Rashid MK, Qader GQ, Manzoor L, *et al*. The contribution of private health facilities to the urban tuberculosis program of Afghanistan. Indian J Tuberc 2023;70:8-11.
11. Fetensa G, Wirtu D, Etana B, Wakuma B, Tolossa T, Gugsa J, *et al*. Tuberculosis treatment delay and contributing factors within tuberculosis patients in Ethiopia: A systematic review and meta-analysis. Heliyon 2024;10:e28699.
12. Teo AK, Singh SR, Prem K, Hsu LY, Yi S. Duration and determinants of delayed tuberculosis diagnosis and treatment in high-burden countries: A mixed-methods systematic review and meta-analysis. Respir Res 2021;22:251.
13. Getiye A, Zakaria HF, Deressa A, Mamo G, Gamachu M, Birhanu A, *et al*. Magnitude and factors associated with delay in treatment-seeking among new pulmonary tuberculosis patients in public health facilities in Habro district, Eastern Ethiopia. Health Serv Insights 2024;17:11786329241232532.
14. Shah HD, Nazli Khatib M, Syed ZQ, Gaidhane AM, Yasobant S, Narkhede K, *et al*. Gaps and interventions across the diagnostic care cascade of TB patients at the level of patient, community and health system: A qualitative review of the literature. Trop Med Infect Dis 2022;7:136.
15. Shetty SM, D. Shivarama P, Shamanewadi AN, Venkatesh R, Pattapally TT, Praveen S, *et al*. Diagnostic delay, expenditure pattern and treatment outcome of extra-pulmonary TB patients of Bangalore Urban District - A mixed method study. Indian J Tuberc 2024. doi: 10.1016/j.ijtb.2024.12.002.
16. Liu Q, Chen Q, Guo Y, Yu S, Rui J, Li K, *et al*. Feasibility of eliminating tuberculosis by shortening the diagnostic delay: A retrospective analysis and modelling study in China during the pre-COVID-19 era. Heliyon 2024;10:e35016.
17. Stanikzai MH, Wafa MH, Rahimi BA, Sayam H. Conducting health research in the current afghan society: Challenges, opportunities, and recommendations. Risk Manag Healthc Policy 2023;16:2479-83.
18. Wondawek TM, Ali MM. Delay in treatment seeking and associated factors among suspected pulmonary tuberculosis patients in public health facilities of Adama town, eastern Ethiopia. BMC Public Health 2019;19:1527.
19. Olayanju O, Otaigbe I, Sodeinde K, Abiodun O, Adebiyi A. Factors associated with delay of patients with cough to tuberculosis treatment centres in selected DOTS in South-West Nigeria. Indian J Tuberc 2025;72:25-31.
20. Arja A, Godana W, Hassen H, Bogale B. Patient delay and associated factors among tuberculosis patients in Gamo zone public health facilities, Southern Ethiopia: An institution-based cross-sectional study. PLoS One 2021;16:e0255327.
21. Wako WG, Wasie A, Wayessa Z, Fikrie A. Determinants of health system diagnostic delay of pulmonary tuberculosis in Gurage and Siltie zones, South Ethiopia: A cross-sectional study. BMJ Open 2021;11:e047986.
22. Alene M, Assemie MA, Yismaw L, Gedif G, Ketema DB, Gietaneh W, *et al.* Patient delay in the diagnosis of tuberculosis in Ethiopia: A systematic review and meta-analysis. BMC Infect Dis 2020;20:797.
23. Jia Y, Jiang W, Xiao X, Lou Z, Tang S, Chen J, *et al.* Patient delay, diagnosis delay, and treatment outcomes among migrant patients with tuberculosis in Shanghai, China, 2018-2020: A mixed-methods study. BMJ Open 2024;14:e082430.
24. Essar MY, Rezayee KJ, Ahmad S, Kamal MA, Nasery R, Danishmand TJ, *et al*. Knowledge, attitude, and practices toward tuberculosis among hospital outpatients in Kabul, Afghanistan. Front Public Health 2022;10:933005.
25. Phutane MS, Sawant PA, Randive AP, Hulsurkar YP, Mahajan US, Kudale AM. Sociocultural aspects of delays in diagnosis among tuberculosis-diabetes comorbid patients in Satara, India: Its implications for the implementation of the national framework for joint tuberculosis-diabetes collaborative activities. Indian J Tuberc 2024;71:250-61.
26. Takarinda KC, Harries AD, Nyathi B, Ngwenya M, Mutasa-Apollo T, Sandy C. Tuberculosis treatment delays and associated factors within the Zimbabwe national tuberculosis programme. BMC Public Health 2015;15:29.
27. Stanikzai MH, Shanawa S, Karimkhil AT, Dadras O. Medical education in afghanistan: challenges and policy implications. Adv Med Educ Pract 2025;16:477-82.
28. Lestari BW, McAllister S, Hadisoemarto PF, Afifah N, Jani ID, Murray M, *et al*. Patient pathways and delays to diagnosis and treatment of tuberculosis in an urban setting in Indonesia. Lancet Reg Health West Pac 2020;5:100059.
29. Shinde AM. Socio-demographic factors and adherence of newly diagnosed pulmonary tuberculosis patients to the newly introduced daily regimen: A hospital survey based follow up study. Indian J Tuberc 2024;71 Suppl 2:S250-7.
30. Malik MA, Sinha R, Priya A, Rahman MH. Barriers to healthcare utilization among married women in Afghanistan: The role of asset ownership and women's autonomy. BMC Public Health 2024;24:613.
31. Satarzadeh L, Tabatabaee SS, Ghavami V, Moghri J. Understanding patient perceptions of access to healthcare centers in one of the major cities of Afghanistan. Sci Rep 2025;15:13500.
32. Pathak MR, Pandya KJ, Ramwani SP, Pingalsur A, Karatela S, Sisodia JA, *et al.* Navigating extrapulmonary tuberculosis: A case series from a tertiary care facility highlighting rare presentations, diagnostic challenges, drug resistance, and therapeutic complexities. Int J Mycobacteriol 2024;13:369-78.
33. Sivaratnam L, Nawi AM, Abdul Manaf MR. An evidence-based clinical pathway for the diagnosis of tuberculous lymphadenitis: A systematic review. Int J Mycobacteriol 2020;9:107-15.
34. Rusmawardiana R, Nursyarifah N, Argentina F, Pamudji R. Dermoscopy and clinicopathology features in diagnosing paucibacillary leprosy: Case series. Int J Mycobacteriol 2022;11:332-6.
35. Alexander V, Rathinam JJ, George JT, Paul JS. Letter to the editor regarding the case report: Unregulated medication use and complications: Is self-medication a common problem with anti-tuberculous therapy (ATT)? Role for patient education. BMC Infect Dis 2024;24:283.
36. Rahimi BA, Rahimy N, Mukaka M, Ahmadi Q, Hayat MS, Wasiq AW. Determinants of treatment failure among tuberculosis patients in Kandahar City, Afghanistan: A 5-year retrospective cohort study. Int J Mycobacteriol 2019;8:359-65.
37. Daka S, Matsuoka Y, Ota M, Hirao S, Phiri A. Turnaround times of the sputum sample courier system at tuberculosis treatment centers in Lusaka, Zambia, 2021. Int J Mycobacteriol 2022;11:103-7.
38. Mohammed H, Oljira L, Roba KT, Ngadaya E, Tesfaye D, Manyazewal T, *et al*. Impact of early chest radiography on delay in pulmonary tuberculosis case notification in Ethiopia. Int J Mycobacteriol 2021;10:364-72.