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Patient Delay And Care-Seeking Pathways in Tuberculosis Diagnosis among Individuals Aged ≥15 Years at Kenyatta National Hospital, Nairobi, Kenya

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Abstract

Background: *Tuberculosis (TB) diagnosis is often delayed when people postpone seeking care after symptom onset. This study assessed patient delay and care-seeking pathways among individuals aged ≥15 years receiving TB care at Kenyatta National Hospital (KNH), Nairobi, Kenya.*

Methods: *A retrospective observational study was conducted among 127 people aged ≥15 years with pulmonary TB receiving care at KNH. Participants were recruited using systematic sampling from the TB treatment register. Data were collected using an interviewer-administered structured questionnaire and clinical-record review. Patient delay was defined as the interval from symptom onset to first consultation with a formal healthcare provider; prolonged patient delay was defined a priori as >14 days. Descriptive statistics, chi-square tests and multivariable logistic regression were performed. Adjusted odds ratios (AORs), 95% confidence intervals (CIs) and p-values are reported.*

Results: *Of 128 patients approached/available during the study period, 127 contributed to the final analysis (99.2%). Females comprised 51.2% (65/127), and the largest age group was 40–49 years (32.3%, 41/127). Perceived TB stigma was reported by 96.9% (123/127), fear following diagnosis by 66.9% (85/127), and residence >10 km from a health facility by 31.5% (40/127). Age group (p=0.032), distance to a health facility (p=0.015) and education (p=0.041) were associated with delay in bivariate analyses; sex was not (p=0.210). After adjustment, none of the examined variables was statistically significant: female sex AOR 1.21 (95% CI 0.65–2.25; p=0.540), age 40–49 years AOR 1.48 (0.78–2.81; p=0.210), distance >5 km AOR 1.72 (0.89–3.31; p=0.103), and lower versus higher education AOR 1.36 (0.72–2.56; p=0.330).*

Conclusion: *Patient delay and barriers to timely TB care were common in this tertiary-care population. The observed bivariate associations did not remain statistically significant after adjustment. Interventions should address TB awareness, stigma, geographical access and timely referral while recognizing that this single-facility study cannot establish causality or population-wide effects.*

Keywords : tuberculosis; patient delay; care-seeking behaviour; diagnostic delay; healthcare access; Kenya.

Introduction

Timely diagnosis and treatment are central to tuberculosis (TB) control because prolonged diagnostic intervals can extend the period during which infectious disease remains undiagnosed. The World Health Organization (WHO) estimated that 10.7 million people developed TB worldwide in 2024, while 8.3 million people were newly diagnosed and officially notified. Thus, global notification represented 78% of estimated incidence, leaving a substantial gap attributable to underdiagnosis and/or underreporting [1, 2].

Kenya remains among the countries with a high TB burden. WHO reported approximately 117,000 incident TB cases and 16,000 TB deaths in Kenya in 2024 [3]. Recent Nairobi research has also documented geographic clustering of delayed diagnosis and associations between diagnostic delay, travel burden and socioeconomic inequalities [4]. These findings underscore the importance of understanding how people move from symptom onset to formal TB diagnosis.

Patient delay refers to the interval between symptom onset and first contact with an appropriate healthcare provider. It may be influenced by symptom recognition, knowledge, stigma, perceived severity, household circumstances, costs and geographical access. Previous systematic reviews have identified patient delay as a substantial component of diagnostic delay in low- and middle-income settings and have reported associations with education, distance and initial use of non-formal providers [5–7].

Kenyan qualitative work has described pluralistic care-seeking pathways involving public facilities, private clinics, drug shops and traditional or informal providers [8]. Such evidence is relevant to interpreting care-seeking pathways, but findings from qualitative studies in other Kenyan settings should not be assumed to represent patients attending KNH.

This study therefore examined patient delay and care-seeking pathways among individuals aged ≥15 years receiving TB care at KNH. The specific objectives were to describe participant characteristics and reported barriers to timely care-seeking, assess factors associated with prolonged patient delay, and describe reported pathways to formal TB diagnosis.

Methods

Study design and setting

A retrospective observational study was conducted at Kenyatta National Hospital (KNH), Nairobi, Kenya, among individuals aged ≥15 years receiving TB care during July–August 2022. KNH is a national referral and teaching hospital with established TB diagnostic and treatment services. The study focused on pulmonary TB because diagnostic pathways and treatment processes differ from extrapulmonary disease.

Study population and sampling

The sampling frame consisted of patients registered in the KNH TB treatment clinic during the study period. Systematic sampling was used: the TB register served as the sampling frame, a sampling interval was calculated, a starting point was selected, and eligible patients were subsequently approached according to the sampling interval. The final analytic sample comprised 127 eligible participants. The study records indicate 128 patients were available/approached and 127 contributed data to the final analysis (99.2%).

Eligibility and informed consent

Participants were eligible if they were aged ≥15 years, had confirmed pulmonary TB, were receiving treatment at KNH during the study period, and consented to participate. Participants with extrapulmonary TB, previous TB treatment, severe illness preventing participation, or non-resident status were excluded. Written informed consent was obtained before questionnaire administration. The interviewer-administered questionnaire required approximately 10–20 minutes and was completed in a private setting.

Data collection

Data were collected using a structured questionnaire adapted from published TB-delay instruments and supplemented by clinical-record review. The questionnaire covered socio-demographic characteristics, symptom history, TB knowledge, healthcare-seeking behaviour, barriers to care and care-seeking pathways. The instrument was pre-tested and translated between English and Kiswahili using translation and back-translation procedures. Clinical records were reviewed to verify diagnosis and treatment-initiation dates where available.

Measurement of patient delay

Patient delay was defined as the interval from onset of TB-related symptoms to first consultation with a formal healthcare provider. Prolonged patient delay was defined a priori as >14 days. The duration was based on participant-reported symptom onset and healthcare contact and was verified against clinical records where possible. The manuscript does not infer a <14-day frequency from the aggregated month-based categories because those categories do not permit a valid reconstruction of that threshold.

Data analysis

Data were analyzed using SPSS version 25. Categorical variables were summarized using frequencies and percentages. Associations between categorical independent variables and prolonged patient delay were assessed using chi-square tests. Variables of epidemiological interest were entered into a binary logistic regression model. Results are reported as AORs with 95% CIs and p-values; $p<0.05$ was considered statistically significant. The analysis was interpreted as identifying statistical associations rather than causal effects or confirmed independent predictors when confidence intervals included the null value.

Qualitative material

The thesis documentation contains references to a qualitative component, but the participant-level qualitative dataset, respondent-level identifiers and interview/FGD records required to provide a reproducible thematic analysis and verbatim quotations are not sufficiently documented in the materials available for this revision. To avoid presenting unsupported qualitative findings, the revised PLOS manuscript is restricted to the documented quantitative component. Qualitative claims and quotations have therefore been removed rather than reconstructed.

Bias and limitations

Recall bias may have affected reported symptom onset. Clinical records were used to verify timelines where possible. Because the study was conducted at a single tertiary referral hospital and included only people who accessed KNH, the findings should not be generalized directly to all people with TB in Kenya. The retrospective design also limits causal interpretation.

Ethical considerations

Ethical approval was obtained from the University of Nairobi/Kenyatta National Hospital Ethics and Research Committee (UoN/KNH-P187/03/2022), Mount Kenya University Ethics Review Committee (MKU/ERC/2079), and the National Commission for Science, Technology and Innovation. Written informed consent was obtained from participants, and

confidentiality was maintained.

Results

Participant characteristics

A total of 127 participants were included. Females accounted for 51.2% (65/127) and males for 48.8% (62/127). The largest age group was 40–49 years (32.3%, 41/127), followed by 30–39 years (26.8%, 34/127). Primary education was reported by 31.5% (40/127), secondary education by 27.6% (35/127), tertiary education by 26.8% (34/127), and no formal education by 14.2% (18/127). Self-employment was reported by 43.3% (55/127).

Table 1: Socio-demographic characteristics of participants (n=127).

Variable	Category	n	%
Sex	Male	62	48.8
Sex	Female	65	51.2
Age	15–29	25	19.7
Age	30–39	34	26.8
Age	40–49	41	32.3
Age	≥50	27	21.2
Education	No formal	18	14.2
Education	Primary	40	31.5
Education	Secondary	35	27.6
Education	Tertiary	34	26.8
Occupation	Unemployed	30	23.6
Occupation	Self-employed	55	43.3
Occupation	Formal employment	42	33.1

Reported barriers and care-seeking

Perceived TB stigma was reported by 96.9% (123/127) of participants and fear following diagnosis by 66.9% (85/127). Regarding distance to a health facility, 36.2% (46/127) lived <5 km away, 32.3% (41/127) lived 5–10 km away, and 31.5% (40/127) lived >10 km away. Participants reported multiple points of care before formal TB diagnosis, including self-medication, pharmacies and informal providers. Because the available aggregated pathway information does not establish the sequence or duration for every individual, the revised manuscript does not represent one pathway as universal and does not claim that informal care independently caused longer delay.

Table 2: Reported psychosocial and access barriers (n=127).

Variable	Category	n	%
Perceived stigma	Yes	123	96.9
Perceived stigma	No	4	3.1
Fear after diagnosis	Yes	85	66.9
Fear after diagnosis	No	42	33.1
Distance to facility	<5 km	46	36.2
Distance to facility	5–10 km	41	32.3
Distance to facility	>10 km	40	31.5

Bivariate associations

Age group (p=0.032), distance to the health facility (p=0.015) and education level (p=0.041) were statistically associated with prolonged patient delay in bivariate analysis. Sex was not statistically associated with delay (p=0.210).

Table 3: Bivariate associations with prolonged patient delay.

Variable	Category	Delayed (%)	Not delayed (%)	p-value
Sex	Male	60.0	40.0	0.210
	Female	63.1	36.9	
Age	15–29	52.0	48.0	0.032
	30–39	58.8	41.2	
	40–49	70.7	29.3	
Distance	<5 km	50.0	50.0	0.015
	>5 km	68.0	32.0	
Education	Primary or less	65.5	34.5	0.041
	Secondary+	55.2	44.8	

Multivariable analysis

None of the variables retained statistical significance after multivariable adjustment. The estimates were compatible with both increased and decreased odds because all 95% CIs included the null value.

Table 4: Multivariable logistic regression for prolonged patient delay.

Variable	Comparison	AOR	95% CI	p-value
Sex	Female vs male	1.21	0.65–2.25	0.540
Age	40–49 vs other age groups	1.48	0.78–2.81	0.210
Distance	>5 km vs <5 km	1.72	0.89–3.31	0.103
Education	Lower vs higher	1.36	0.72–2.56	0.330

AOR, adjusted odds ratio; CI, confidence interval. Reference categories are shown in the comparison column. None of the adjusted associations was statistically significant at p<0.05.

Discussion

This study examined patient delay and care-seeking pathways among 127 people receiving TB care at a national referral hospital in Nairobi. The findings show a substantial burden of reported barriers to timely care, particularly perceived stigma, fear following diagnosis and geographical distance. Age, distance and education were associated with delay at the bivariate level, but none remained statistically significant after adjustment.

The high prevalence of perceived stigma is consistent with evidence that TB stigma can affect disclosure, healthcare-seeking and social participation [9]. Fear following diagnosis was also common in this study. These findings support the importance of patient-centred communication and community approaches that address misconceptions and anticipated social

consequences of TB.

Distance to a health facility was associated with delay in bivariate analysis. This is consistent with evidence from sub-Saharan Africa showing that enabling and access-related factors can contribute to diagnostic delay [6]. Recent Nairobi research similarly reported geographic clustering of delayed TB diagnosis and relationships between delay, travel burden and socioeconomic conditions [4]. The present study was conducted at KNH and did not geocode participants; therefore, the findings should not be interpreted as a spatial analysis of Nairobi.

Participants reported more than one type of initial care-seeking contact, including self-medication, pharmacies and informal providers. Similar pluralistic pathways have been documented in Kenya [8]. However, the current study does not provide sufficiently documented group-specific mean or median delay estimates to quantify the difference between informal-provider/self-medication groups and other participants. We therefore do not infer a causal effect from these pathways.

The lack of statistically significant independent associations after adjustment is also important. The bivariate findings indicate that age, distance and education were associated with the outcome before adjustment, but the multivariable estimates were imprecise and all confidence intervals included 1.00. This may reflect confounding, limited sample size or heterogeneity in patient pathways. The findings therefore support attention to these factors without claiming that any one factor independently predicts delay in this study.

Taken together, the results support practical attention to early symptom recognition, stigma reduction, accessible diagnostic services and efficient referral. These implications are consistent with the WHO emphasis on prompt access to quality-assured TB diagnosis and treatment [2]. They should, however, be interpreted in the context of this single-facility study.

Strengths and limitations

A strength of the study is the combination of participant-reported information with clinical-record review to reconstruct care timelines. The study also used a predefined patient-delay outcome and multivariable analysis. Limitations include potential recall error, particularly for symptom onset; incomplete ability to reconstruct a <14-day category from the retained aggregated month-based presentation; single-facility recruitment; and limited external generalizability. The study cannot establish causality. The qualitative material described in earlier study documentation was not included in the revised analysis because the participant-level qualitative records required for reproducible reporting were not available for verification.

Conclusion

Patient delay and barriers to timely TB care were common among participants receiving care at KNH. Perceived stigma, fear following diagnosis and geographical access were prominent reported barriers, while age, distance and education showed bivariate associations with delay. None remained statistically significant after multivariable adjustment. Strategies to promote earlier TB diagnosis should address symptom awareness, stigma, accessibility and referral pathways, while further multicentre research is needed to establish how these factors operate across Kenya.

Data availability

The underlying participant-level data contain potentially identifiable and sensitive human participant information. Public deposition could compromise confidentiality and conflict with the conditions approved by the University of Nairobi/Kenyatta National Hospital Ethics and Research Committee (UoN/KNH-P187/03/2022) and Mount Kenya University Ethics Review Committee (MKU/ERC/2079). De-identified data may be made available to qualified researchers upon reasonable request and subject to approval by the relevant ethics committees and institutional authorities. Data-access requests may be directed.

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Competing interests

The authors declare no competing interests.

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