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Original Article

Awareness and Perceived Availability of Tuberculosis Control Program Services Among Pulmonary Tuberculosis Patients in Lahore, Pakistan: A Multicenter Cross-Sectional Study

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ABSTRACT

Background: Effective tuberculosis (TB) control depends on service availability and patients' awareness of program activities and available care. Evidence regarding awareness and perceived availability of TB control services among patients in Pakistan remains limited. Objective: To assess awareness of TB control program activities and perceived availability of preventive, treatment, and pharmacy services among patients with pulmonary tuberculosis (PTB) in Lahore, Pakistan. Methods: This multicenter descriptive cross-sectional study included 330 adults with documented PTB receiving treatment at eight healthcare facilities in Lahore between September 2023 and September 2024. Participants were recruited through convenience sampling and interviewed face-to-face using a structured questionnaire. Data were summarized using descriptive statistics. Results: Only 46 (13.9%) participants reported an operational TB control program in their area, while 136 (41.2%) were unsure. Twelve (3.6%) had witnessed a program activity, none reported a visit by a TB control worker, and 65 (19.7%) reported receiving counselling. Preventive, treatment, and pharmacy services were perceived as available by 190 (57.6%), 138 (41.8%), and 198 (60.0%) participants, respectively. Conclusion: Awareness of TB control activities was limited, with substantial uncertainty regarding service availability. Improved counselling, patient education, and service communication may strengthen care navigation. Keywords: Tuberculosis; Pulmonary tuberculosis; Patient awareness; Service availability; Patient-centered care.

INTRODUCTION

Tuberculosis (TB) remains a major global public-health problem despite being preventable and curable. In 2024, an estimated 10.7 million people developed TB and approximately 1.23 million died from the disease, with the burden disproportionately concentrated in low- and middle-income countries. Persistent socioeconomic inequalities, constrained healthcare resources, delayed care-seeking, and barriers to accessing diagnosis and treatment

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continue to impede TB control. The World Health Organization (WHO) End TB Strategy consequently emphasizes early diagnosis, quality-assured treatment, preventive services, patient-centred care, community engagement, and equitable access to healthcare as essential components of global TB control (1).

Pakistan remains a high-TB-burden country despite sustained national control efforts. The National Tuberculosis Control Program (NTP) provides diagnostic and treatment services through public-sector facilities and public-private partnerships, including sputum-based testing, GeneXpert testing, chest radiography, directly observed treatment, anti-tuberculosis medicines, treatment monitoring, contact investigation, counselling, and referral services. Nevertheless, patients may continue to experience financial barriers, delayed diagnosis, fragmented care, and difficulties accessing or navigating available services, which can interfere with continuity of TB care and progress towards national disease-control targets (2–4).

Patient awareness represents an important component of effective engagement with TB services. Awareness of available services, their location, and their purpose may facilitate timely healthcare seeking, appropriate use of preventive and diagnostic services, treatment adherence, and continuity of care. Conversely, inadequate information about healthcare services and uncertainty regarding where care can be obtained may create additional barriers during the diagnostic and treatment pathway. Contemporary patient-centred approaches therefore extend beyond biomedical treatment to include provision of understandable information, counselling, social support, and assistance in navigating healthcare services (5,6).

Patients' perceptions of healthcare availability are also relevant to service utilization. Perceived availability reflects patients' understanding of whether required healthcare services can be obtained and accessed when needed and may be influenced by communication with healthcare providers, accessibility of facilities, availability of medicines and diagnostic services, waiting times, continuity of care, and familiarity with referral pathways. Community engagement and accessible patient-facing services are consequently important components of efforts to improve access to TB prevention and care, particularly among vulnerable populations (7,8).

Patient-centred TB care encompasses more than diagnosis and pharmacological treatment. Counselling, health education, social and psychosocial support, treatment follow-up, adverse-effect management, community-based support, and clear communication regarding available services may influence patients' engagement across the TB care pathway. Evidence from active case-finding and treatment-support initiatives further indicates that patients' knowledge, perceptions, treatment experiences, and interactions with health services are important considerations when designing interventions intended to improve engagement and adherence (9,10).

Previous research in Pakistan has predominantly examined TB-related knowledge, attitudes and practices, stigma, health-seeking behaviour, treatment adherence, and associated barriers. Studies conducted in both urban healthcare settings and rural communities have demonstrated persistent gaps in TB-related knowledge and health-seeking behaviour, supporting the need for stronger patient education and communication strategies (11,12). However, comparatively limited evidence addresses whether patients already receiving treatment recognize the activities of the TB control program or understand the availability of preventive, treatment, and pharmacy services within the healthcare system. This distinction is important because knowledge of TB as a disease does not necessarily imply awareness of the wider program or the services through which continuing care and support can be obtained. Therefore, this multicenter cross-sectional study aimed to assess awareness of TB control program activities and perceived availability of TB preventive, treatment, and pharmacy services among patients with pulmonary tuberculosis (PTB) receiving care at selected healthcare facilities in Lahore, Pakistan.

MATERIALS AND METHODS

A multicenter descriptive cross-sectional study was conducted among patients with documented PTB receiving treatment at selected healthcare facilities in Lahore, Pakistan, between September 2023 and September 2024. The study was reported with reference to the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) recommendations for observational research (13). The research was conducted in accordance with the Declaration of Helsinki (14). Ethical approval was obtained from the Ethical Review Committee of Lincoln University College, Malaysia (ERC No. LUC/RMC/2023/014), and administrative approval was obtained from all participating healthcare facilities before data collection.

Eight TB treatment facilities were included to capture patients receiving care across different healthcare settings in Lahore. Facilities were selected using the Directory of TB Centers and records of the Pakistan Anti-Tuberculosis Association (PATA). The participating sites comprised Sir Ganga Ram Hospital, Social Security Hospital, Mayo Hospital, Services Hospital, three Lahore District Tuberculosis Association facilities located at 33-F Gulberg II, 28 Nisbat Road, and Kaura Pind Walton, and the University of Lahore Hospital.

Participants were recruited using a non-probability convenience sampling technique until the required sample size was achieved. Adults aged 18–75 years with a documented diagnosis of PTB who were receiving TB treatment at one of the participating facilities were eligible for inclusion. Patients with extrapulmonary TB, other chronic respiratory diseases, or severe comorbidities including diabetes mellitus, cardiovascular disease, chronic kidney disease, or liver disease were excluded, as were pregnant women.

The sample size was determined using a single-proportion formula, which yielded a minimum required sample of 329 participants. A total of 330 participants were recruited and included in the study. Data were collected through face-to-face interviews using a structured questionnaire, with all interviews conducted by the principal investigator at the participating healthcare facilities.

The questionnaire collected sociodemographic information including age, gender, educational status, and employment status. Awareness of TB control program activities was assessed using four indicators: participants' awareness of an operational TB control program in their area, whether they had witnessed a TB control program activity in their area, whether they had been visited by a TB control program worker, and whether they had received counselling from a TB control program worker. Responses to these items were recorded as "yes," "no," or "not sure."

Perceived availability of TB services was assessed separately from awareness of program activities. Participants were asked whether public-sector healthcare facilities in their area offered TB preventive services, TB treatment services, and pharmacy services for TB treatment. Each item was recorded using the same three response categories: "yes," "no," and "not sure." These responses represented participants' perceptions of service availability rather than an independent facility-level verification of whether each service was objectively available.

Data were analysed using IBM SPSS Statistics version 27. Descriptive statistics were used because the study objective was to characterize participants and describe their awareness of TB control program activities and perceptions of service availability. Age was summarized using the mean and standard deviation. Categorical variables, including gender, educational status, employment status, TB program awareness indicators, and perceived availability of TB services, were summarized as frequencies and percentages.

RESULTS

A total of 330 participants with PTB were included in the analysis. Their mean age was 42.4 ± 15.99 years. Of the participants, 214 (64.8%) were male and 116 (35.2%) were female. Regarding educational status, 127 (38.5%) had education below matriculation and 108 (32.7%) were illiterate. In relation to employment status, 153 (46.4%) were unemployed, 140 (42.4%) were employed, and 37 (11.2%) were students.

Table 1. Awareness of and Exposure to TB Control Program Activities Among Participants

TB control program indicator	Yes, n (%)	No, n (%)	Not sure, n (%)
Operational TB control program in the area	46 (13.9)	148 (44.8)	136 (41.2)
Witnessed TB program activity in the area	12 (3.6)	260 (78.8)	58 (17.6)
Visited by a TB control program worker	0 (0.0)	309 (93.6)	21 (6.4)
Counselled by a TB control program worker	65 (19.7)	214 (64.8)	51 (15.5)

Awareness of and exposure to TB control program activities were limited (Table 1). Only 46 (13.9%) participants reported that an operational TB control program existed in their area, whereas 148 (44.8%) reported that no such program was operational and 136 (41.2%) were unsure. Only 12 (3.6%) participants reported having witnessed a TB program activity in their area; 260 (78.8%) had not witnessed such an activity and 58 (17.6%) were unsure. None of the participants reported having been visited by a TB control program worker, while 309 (93.6%) reported no such visit and 21 (6.4%) were unsure. Counselling by a TB control program worker was reported by 65 (19.7%) participants, whereas 214 (64.8%) reported that they had not received such counselling and 51 (15.5%) were unsure.

Perceived service availability varied across the three service categories (Table 2). TB preventive services were perceived as available by 190 (57.6%) participants, while 23 (7.0%) considered them unavailable and 117 (35.5%) were unsure. TB treatment services were perceived as available by 138 (41.8%) participants; 73 (22.1%) reported that these services were unavailable and 119 (36.1%) were unsure.

Table 2. Participants' Perceived Availability of TB Services at Public-Sector Healthcare Facilities

TB service	Yes, n (%)	No, n (%)	Not sure, n (%)
TB preventive services	190 (57.6)	23 (7.0)	117 (35.5)
TB treatment services	138 (41.8)	73 (22.1)	119 (36.1)
TB pharmacy services	198 (60.0)	14 (4.2)	118 (35.8)

Pharmacy services had the highest reported perceived availability, with 198 (60.0%) participants reporting that they were available, compared with 14 (4.2%) who considered them unavailable and 118 (35.8%) who were unsure. Thus, more than one-third of participants were uncertain about the availability of each of the three categories of TB services assessed.

DISCUSSION

This multicenter cross-sectional study identified substantial gaps in awareness of and exposure to TB control program activities among patients already receiving treatment for PTB in Lahore. Only 13.9% of participants recognized an operational TB control program in their area, 41.2% were unsure whether such a program existed, and only 3.6% had witnessed a program activity. Direct reported engagement with program personnel was also limited: none of the participants reported having been visited by a TB control program worker, while only 19.7% reported receiving counselling from such a worker. Perceptions of service availability were more favorable than awareness of program activities, although considerable uncertainty persisted. Preventive and pharmacy services were perceived as available by more than half of participants, whereas only 41.8% reported availability of treatment services. More than one-third remained unsure about the availability of every service category assessed. Collectively, these findings indicate a substantial gap between patients' participation in TB treatment and their awareness of the broader TB control program and service network.

The limited awareness observed in the present study is important in the context of previous evidence from Pakistan. Studies conducted among patients attending outpatient facilities and communities in Pakistan have demonstrated persistent deficiencies in TB-related knowledge, attitudes, practices, and health-seeking behaviour, emphasizing the continuing importance of patient education and effective communication within TB control strategies (11,12). The present findings extend this evidence by demonstrating that limited awareness may concern not only knowledge of TB as a disease but also recognition of the program structures and services intended to support patients during prevention, diagnosis, treatment, and follow-up. Community-level program visibility may therefore constitute an additional dimension of patient engagement. Experience from Pakistan with active contact tracing has shown that structured community-based TB activities can facilitate identification and engagement of contacts, while historically such activities have often depended on targeted or donor-supported implementation rather than uniform integration into routine provincial programs (15). Consequently, limited patient exposure to visible community-level program activities may contribute to uncertainty regarding the broader range of TB services available beyond the facility where treatment is received.

Patient-centred TB care requires engagement extending beyond the dispensing of anti-tuberculosis medication. A scoping review of patient-centred TB interventions identified information, communication, psychosocial support, socioeconomic support, and continuity across prevention, diagnosis, and treatment as important components of comprehensive care, while also demonstrating that many interventions address only selected components of this continuum (16). This is particularly relevant in Pakistan, where non-adherence to anti-tuberculosis treatment has been associated with multiple patient, treatment, and healthcare-related factors, emphasizing the importance of sustained communication and support during treatment (17). The low proportion of participants reporting counselling in the present study therefore represents an important patient-facing service gap. Counselling provides an opportunity to address disease transmission, treatment duration, medication use, adherence, preventive measures, follow-up requirements, misconceptions, and available support services. Evidence from TB literacy and counselling interventions demonstrates that structured communication is feasible and can improve patients' understanding and treatment experience (18).

The relevance of counselling is further supported by evidence from Pakistan. At a private TB program in Karachi, participants who received structured counselling demonstrated better knowledge across disease, treatment, and prevention domains than those who had not received counselling (19). Although the present study did not evaluate the effectiveness or content of counselling, only 65 (19.7%) participants reported receiving counselling from a TB control program worker. This finding suggests that more systematic integration of structured education into routine patient encounters could provide an opportunity to improve awareness of both TB itself and the services available through the treatment pathway. Counselling should therefore encompass not only medication instructions but also information concerning prevention, diagnostic and treatment facilities, medication access, follow-up services, contact-related services, and referral pathways.

The findings concerning perceived service availability also warrant attention. Pharmacy services had the highest perceived availability at 60.0%, followed by preventive services at 57.6%, whereas treatment services were perceived as available by only 41.8% of participants. Previous research conducted among patients receiving TB care in Lahore has demonstrated that accessibility, communication, facility experience, medication-related services, and healthcare service quality contribute to patients' perceptions and satisfaction with TB care (20). More broadly, a systematic review examining barriers to TB diagnosis and treatment across countries identified limited information, health-system fragmentation, insufficient decentralization, distance, coordination problems, and other structural barriers as factors that can impede access to TB services (21). The current findings therefore suggest that service provision alone may be insufficient when patients do not clearly know where services are located, which services are available, or how different components of the TB care pathway are connected.

The high frequency of "not sure" responses is particularly informative and should not be interpreted as evidence that the corresponding services were objectively unavailable. More than one-third of participants were uncertain about preventive, treatment, and pharmacy services. Patient-reported availability reflects knowledge and perception of the healthcare system rather than independently verified facility-level service provision. A global systematic review of satisfaction among patients with TB identified accessibility, interactions with healthcare workers, waiting time, counselling, health education, and characteristics of service delivery as important determinants of patients' experiences with TB services (22). Similarly, evidence from low- and middle-income countries indicates that user experience in TB care is influenced by accessibility, communication, coordination, dignity, responsiveness, and continuity of services across the care pathway (23). Accordingly, uncertainty in the present study may represent difficulties in health-system navigation, inadequate communication regarding available services, or limited familiarity with the wider TB service network rather than actual absence of those services.

The relatively low perceived availability of treatment services is notable because every participant had a documented diagnosis of PTB and was already receiving treatment at a participating healthcare facility. This apparent discrepancy may indicate that participants understood the questions as referring to the wider public-sector service network in their local area rather than the specific facility through which they were receiving treatment. It also illustrates the distinction between receiving a particular service and possessing broader knowledge of where equivalent or complementary services can be accessed. Patient-centred models of care emphasize clear information and continuity across service interfaces, and improved communication concerning the location, purpose, and referral pathways of preventive, diagnostic, treatment, pharmacy, and follow-up services may therefore facilitate healthcare navigation (16,23).

Taken together, the findings suggest that awareness of TB control program activities and perceived availability of services are related dimensions of the patient-facing experience of TB care. Low exposure to identifiable program activities, limited reported counselling, and substantial uncertainty regarding service availability indicate opportunities for strengthening communication between TB programs, healthcare facilities, patients, and communities. Structured counselling and disease-specific education have demonstrated value in increasing patient knowledge, while patient-centred interventions emphasize continuous communication and support throughout the TB pathway (18,19). Routine provision of concise information regarding locally available services, referral pathways, medication access, preventive services, and follow-up options could therefore complement clinical treatment and improve patients' ability to navigate TB services.

This study has several strengths. It included 330 patients with documented PTB recruited from eight facilities representing public hospitals, a private hospital, and district tuberculosis association settings in Lahore. The multicenter approach captured patient perspectives across different healthcare environments, and the study addressed a comparatively underexplored aspect of TB care by distinguishing awareness of program activities from perceived availability of specific services. The use of three response categories also allowed uncertainty to be identified rather than forcing participants to classify services as either available or unavailable.

Several limitations should be considered when interpreting the findings. Participants were recruited through non-probability convenience sampling, which may have introduced selection bias and limits generalizability beyond the participating facilities. The study was conducted exclusively in Lahore and may not represent patients receiving TB care in rural communities or other regions of Pakistan. Participants with several important chronic comorbidities were excluded, further limiting applicability to the broader population of patients with TB. Awareness, program exposure, counselling, and service availability were assessed through self-report and may therefore have been influenced by recall, interpretation, or reporting bias. Perceived service availability was not independently verified at the facility or health-system level and should consequently not be interpreted as an objective measure of service provision. In addition, the cross-sectional design provides a description of awareness and perceptions at a single period and does not establish temporal or causal relationships. The questionnaire assessed individual dimensions of awareness and perceived availability rather than generating a validated composite awareness or service-availability score.

CONCLUSION

Substantial gaps were identified in awareness of and exposure to TB control program activities among patients with PTB receiving treatment in Lahore, together with considerable uncertainty regarding the perceived availability of preventive, treatment, and pharmacy services. Despite being engaged in TB treatment, many participants demonstrated limited recognition of the wider TB control program and its service network. Integrating structured counselling and patient education into routine care and providing clear, consistent information regarding available services and referral pathways may strengthen service navigation and patient engagement with TB care.

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