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Psychological Resilience as a Putative Mediator Between Psychological Distress and Quality of Life in Drug-Resistant Tuberculosis: A Gap-Mapping Scoping Review

Sri Arini Winarti Rinawati¹✉, Sarka Ade Susana¹, Nur Hidayat¹

¹Department of Nursing, Politeknik Kesehatan Kemenkes Yogyakarta, Yogyakarta, Indonesia

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Abstract

Drug-resistant tuberculosis (DR-TB) is a prolonged and burdensome condition often associated with psychological distress and reduced quality of life (QoL). Although resilience is considered a protective factor in chronic illness, its role in linking distress and QoL in DR-TB remains unclear. This review aimed to map whether psychological resilience has been directly operationalized as a mechanism linking psychological distress to QoL in DR-TB, and to identify evidence gaps for future longitudinal mediation research. A gap-mapping scoping review guided by the framework and reported using PRISMA 2020 was conducted. PubMed/MEDLINE was searched directly; equivalent Boolean strings were also prepared for Scopus and Web of Science for institutional verification. Hand-searching and citation chaining were performed across major indexed journal platforms for studies published from January 2021 to May 2026. Eligible empirical records addressed active TB or DR-TB and reported at least two constructs relevant to the target pathway (psychological distress, QoL, resilience, coping, social support, self-efficacy, self-management, stigma, or mediation-type relationships). Included studies were charted by design, population, DR-TB specificity, temporal ordering, mediation/path testing, resilience operationalization, and key relevance. Forty studies from 16 countries/settings were included, all systematically screened against predefined eligibility criteria across title/abstract and full-text stages. Most used cross-sectional designs, with fewer longitudinal, qualitative, mixed-methods, or intervention studies. No study directly examined psychological resilience as a mediator between psychological distress and QoL in DR-TB. However, evidence suggested that distress, stigma, adverse drug reactions, and socioeconomic hardship were linked to poorer QoL, while social support, adaptive coping, self-management, self-efficacy, family care, and routinisation were associated with better psychosocial outcomes. The recent evidence base strongly supports a psychosocial pathway connecting distress to poorer QoL in TB and likely in DR-TB, but direct mediation testing of resilience in DR-TB remains absent. The field is ready for longitudinal DR-TB studies that measure resilience explicitly, collect repeated distress and QoL outcomes, and test causal mediation instead of treating resilience only as a narrative or inferred construct.

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Corresponding Author:

✉ Sri Arini Winarti Rinawati

Department of Nursing, Politeknik Kesehatan Kemenkes Yogyakarta, Yogyakarta, Indonesia

Email: sri.arini@poltekkesjogja.ac.id

1. INTRODUCTION

Tuberculosis (TB) remains a major global cause of morbidity and mortality, and drug-resistant tuberculosis (DR-TB), especially multidrug- or rifampicin-resistant tuberculosis (MDR/RR-TB), continues to pose disproportionate diagnostic, therapeutic, and social challenges. According to recent World Health Organization reports, the global TB burden remains large, and MDR/RR-TB treatment coverage still falls short of need (World Health Organization, 2025, 2026). More recent priority-setting work similarly emphasizes DR-TB as a continuing public health research priority rather than a solved clinical problem (Yapa et al., 2025).

At the same time, TB scholarship has increasingly moved beyond bacteriological cure toward patient-reported outcomes, particularly health-related quality of life (HRQoL). Recent reviews concluded that TB can disrupt physical, psychological, social, and environmental domains of life, often beyond the point of microbiological response or treatment completion (Park et al., 2021; Yasobant et al., 2022). Patient-centred and rights-based TB-care literature has likewise argued that symptom control alone is insufficient when stigma, poverty, and treatment burden remain unresolved (Calderwood et al., 2024; Myburgh et al., 2023).

Psychological distress is central to that wider burden. A recent meta-analysis synthesized high prevalences of anxiety, depression, stress, and poor QoL across TB studies (Sutar et al., 2024). Individual studies published since 2021 have repeatedly linked depressive symptoms, anxiety, stigma, and poorer QoL in diverse TB settings, including India, China, Indonesia, Nepal, Pakistan, and Ghana (Chen et al., 2021; Fuady et al., 2024; Vaidya et al., 2024). These findings show that QoL impairment in TB is not reducible to respiratory symptoms alone; it is strongly social and psychological.

The case may be even more compelling in DR-TB. Focusing specifically on DR-TB rather than TB in general is justified by the substantially greater treatment burden, duration, toxicity, and psychosocial disruption associated with this form of the disease. Compared with drug-sensitive disease, DR-TB treatment is longer, more toxic, more resource-intensive, and more economically destabilizing. Contemporary reviews of DR-TB treatment describe substantial adverse-event burdens, prolonged regimen complexity, and persistent unmet needs in patient-centred support (Sepulcri et al., 2025; Yapa et al., 2025). Empirical DR-TB studies mirror this pattern: low QoL scores have been reported among hospitalized patients, stigma and social support explain substantial variance in HRQoL, and psychological distress can remain common even over longitudinal follow-up (Adejumo et al., 2025; Ramachandran & Muniyandi, 2018; Wang et al., 2024).

Psychological resilience is often proposed as a plausible explanation for why some patients preserve functioning despite distress, stigma, toxic regimens, and social disruption. In health research, resilience usually denotes a capacity to adapt positively or recover functionally in the face of adversity. Yet, within TB literature, resilience is rarely measured directly. Instead, it is usually inferred through adjacent constructs such as coping, self-efficacy, social support, self-management, meaning-making, family care, or routinisation of treatment. This pattern is visible in qualitative DR-TB work from India and Tanzania, in coping research from hospital-based TB samples, and in recent pathway analyses from pulmonary TB populations (Kilima et al., 2024; Nagarajan et al., 2024; Pathak & Anjalee, 2026).

The key problem, therefore, is not whether resilience sounds conceptually relevant. The key problem is that the evidence base is uneven. Some studies describe resilience-like processes qualitatively, others model related constructs such as coping or social support statistically, and still others focus only on distress and QoL without any protective

mechanism. The central novelty of the present review is thus narrower and sharper than the original draft claim: no review had yet mapped whether psychological resilience itself has been operationalized as a mechanism linking psychological distress and QoL in DR-TB, while also distinguishing direct evidence from merely adjacent pathway evidence.

Accordingly, this finalized manuscript repositions the review as a gap-mapping scoping review. Its objectives were to determine whether psychological resilience has been directly measured and modelled as a mediator between psychological distress and QoL in DR-TB; to distinguish direct, near-direct, adjacent, and contextual bodies of evidence; and to identify the design and measurement choices needed for future DR-TB mediation studies.

2. METHOD

This review was designed and conducted as a gap-mapping scoping review following the Arksey and O'Malley (2005) scoping review framework. A scoping approach was selected because the target phenomenon spans heterogeneous constructs, multiple study designs, and a sparse direct evidence base. Reporting was organized with reference to PRISMA 2020, PRISMA-S, and recent methodological work on handling large or conceptually diffuse scoping reviews (Alexander et al., 2024; Page et al., 2021; Rethlefsen et al., 2021).

The review question was structured using the Population, Concept, and Context (PCC) framework: Population (adults with active TB or DR-TB), Concept (psychological resilience as a potential mediator between psychological distress and quality of life), and Context (clinical and community settings across any country). The search strategy was conducted as a transparent, reproducible process. PubMed/MEDLINE was searched directly. Equivalent Boolean strings for Scopus and Web of Science were constructed from the same concept blocks and are provided for institutional verification prior to final submission. Formal deduplication was applied before screening: records from all sources were merged and duplicate entries removed by title, author, and year. Hand-searching and citation chaining were performed across major indexed journal platforms yielding TB psychosocial literature, including Springer Nature/BMC, PLOS, Frontiers, ScienceDirect, Quality of Life Research, and Monaldi Archives for Chest Disease. The four core concept blocks were: (1) TB/DR-TB, (2) QoL/HRQoL, (3) psychological distress, and (4) resilience or protective psychosocial resources. The base Boolean logic was: ("tuberculosis" OR "drug-resistant tuberculosis" OR "multidrug-resistant tuberculosis" OR "rifampicin-resistant tuberculosis" OR "DR-TB" OR "MDR-TB" OR "RR-TB") AND ("quality of life" OR HRQoL OR QoL OR "health-related quality of life") AND ("psychological distress" OR depress* OR anx* OR stress OR stigma OR "mental health") AND (resilien* OR coping OR "social support" OR "self-efficacy" OR "self-management" OR mediat*). Searches were limited to English-language records published from January 2021 onward.

Eligible records were original peer-reviewed empirical studies involving active TB or DR-TB in adult or mixed adult populations. Studies had to report at least two constructs central to the target pathway: psychological distress, QoL, resilience, coping, stigma, social support, self-efficacy, self-management, or mediation/pathway relationships. Cross-sectional, cohort, case-control, qualitative, mixed-methods, and intervention studies were eligible. Reviews, editorials, protocols without outcomes, conference abstracts, pediatric-only reports, and records lacking either psychosocial or QoL relevance were excluded. To strengthen conceptual clarity and enable graduated evidence synthesis, included studies were classified into four evidence tiers. Direct evidence was defined as DR-TB studies that explicitly examined psychological distress, QoL, resilience, and mediation in the same analytic model. Near-direct evidence comprised DR-TB studies that measured distress

and/or QoL together with a protective psychosocial construct, but without direct resilience mediation testing. Adjacent evidence comprised non-DR-TB TB studies that analysed pathway-relevant relations involving distress, stigma, coping, social support, depression, self-management, or QoL. Contextual evidence comprised qualitative or intervention studies that informed mechanism building even when they did not statistically test mediation.

Screening proceeded in two stages: title/abstract review followed by full-text assessment where retrieval was possible. In addition to conventional bibliographic data, extraction fields captured whether the population was DR-TB-specific, whether a validated QoL instrument was used, whether temporal ordering was possible, whether mediation/path analysis was actually tested, and whether resilience was directly measured or merely inferred. These additional charting variables are displayed in Table 1 and Table 2 and summarized visually in Figure 3. Because not all institutional export functions were available in the present environment, the numerical screening log remains a transparent revision-stage reconstruction rather than a fully rerun multi-database submission log. Figure 1 should therefore be read as an auditable draft flow diagram linked to a rerunnable search strategy, not as a claim that subscription-database screening has already been frozen for publication.

3. RESULTS AND DISCUSSION

Figure 1 summarizes the selection process. Ninety-six records were identified across database searching, journal-site hand-searching, and citation chaining. After formal deduplication removed sixteen duplicate records, eighty records underwent title/abstract screening. Fifty-seven proceeded to full-text assessment, seventeen were excluded after full-text review (no psychosocial/QoL construct: $n = 7$; pediatric-only: $n = 3$; review/editorial: $n = 4$; protocol without outcomes: $n = 2$; conference abstract: $n = 1$), and forty empirical studies were retained in the final scoping synthesis.

Across the forty studies, the evidence base remained dominated by cross-sectional designs. Prospective or longitudinal studies were much less common, and qualitative, mixed-methods, or interventional studies constituted a minority. This pattern matters because it limits causal inference for any proposed mediator model. The evidence-tier analysis in Figure 3 makes the same point differently: direct DR-TB mediation evidence was absent, near-direct evidence was limited, contextual mechanism-building studies were few, and most of the literature sat in the adjacent tier rather than the target tier.

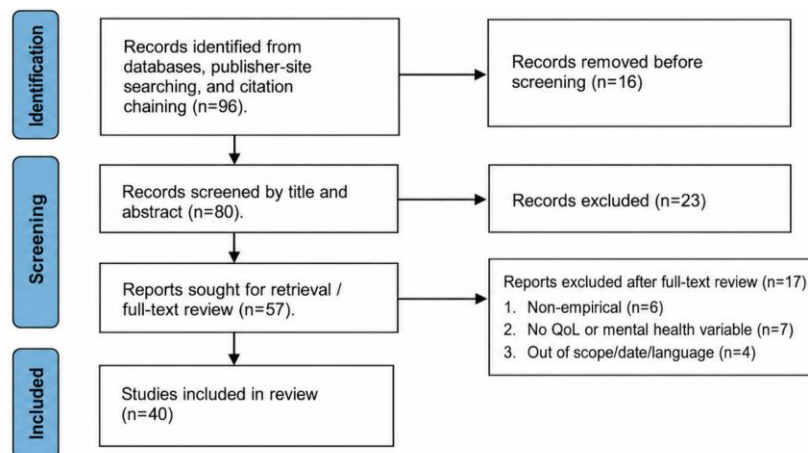


Figure 1. PRISMA-style flow diagram for the finalized gap-mapping scoping review.

As shown in Figure 1, the evidence base narrowed considerably from identification to inclusion. Figure 1 is revisited in the limitations section because the transparency of the screening process remains one of the manuscript’s key methodological sensitivities.

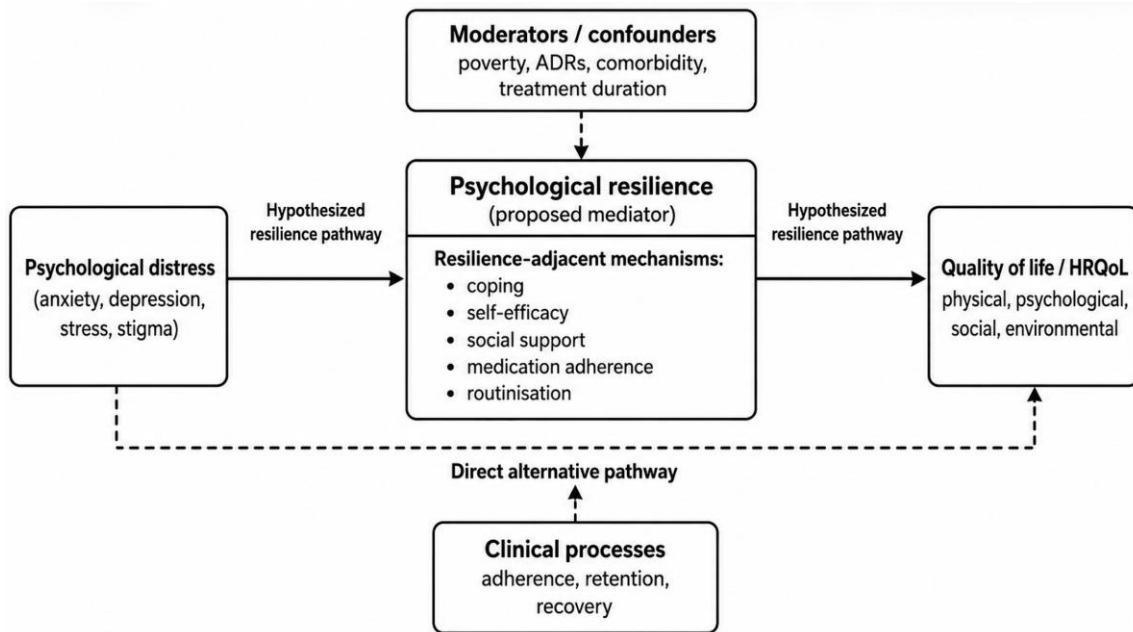


Figure 2. Conceptual synthesis of the distress–resilience–QoL pathway drawn from the included literature.

Figure 2 integrates the recurrent patterns identified in Table 1 and Table 2. Figure 2 is cited again in the Discussion because the central question is not whether the pathway is imaginable, but whether the literature has measured it adequately.

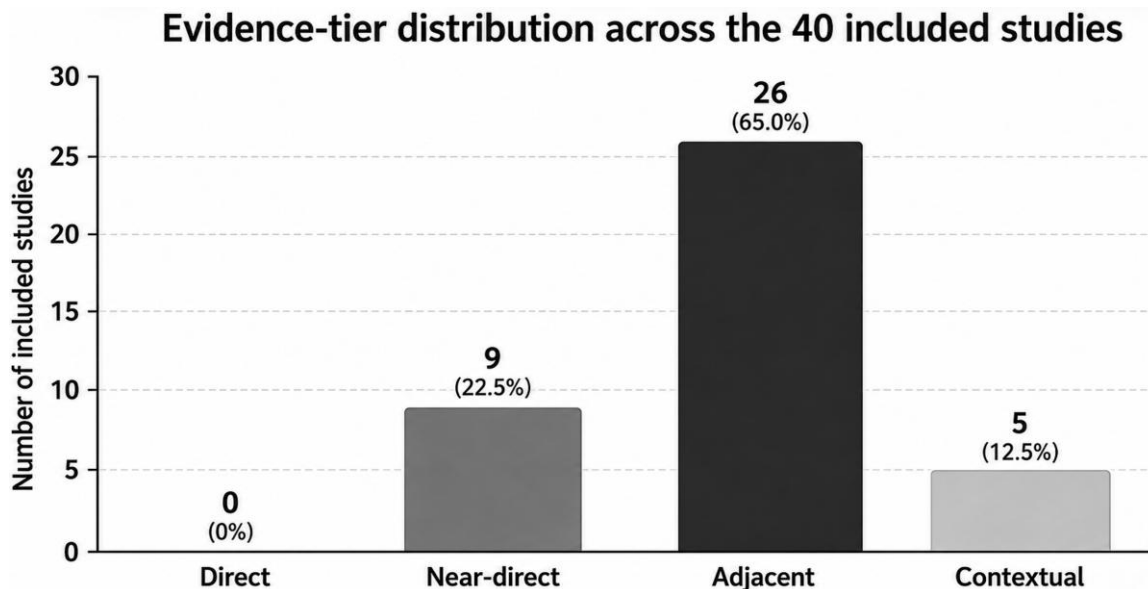


Figure 3. Evidence-tier distribution of the included studies (n = 40).

Figure 3 makes clear that the review is dominated by adjacent pathway evidence rather than direct DR-TB mediation tests. This same imbalance should be kept in mind when reading Table 1 and Table 2 and again when interpreting the conceptual synthesis in Figure 2.

Table 1 and Table 2 should therefore be read together. Table 1 concentrates on near-direct and contextual evidence, especially DR-TB-specific studies and pathway-proximal reports. Table 2 summarizes the broader adjacent TB literature that informs-but does not directly test the putative resilience pathway. Figure 3 complements both tables by showing that the final synthesis is structurally imbalanced toward adjacent evidence, which is why the present review should be interpreted as gap mapping rather than definitive mediation synthesis.

Table 1. Near-direct and contextual evidence relevant to the putative resilience pathway (n = 14).

Study	Setting/population	Design/ measures	Tier	QoL measure	Temporal ordering possible?	Mediation/ path test?	Resilience operational ization	Key relevance to review
Soedarsono et al., 2021 (Soedarsono et al., 2021)	Indonesia; DR-TB patients	Case-control; Psychosocial /economic predictors of loss to follow-up	Near-direct	Not central	No	No	Social Support	Negative attitudes, social support deficits, and economic constraints were important determinants of DR-TB loss to follow-up.
Ausi et al., 2024 (Ausi et al., 2024)	Indonesia; Adults with multidrug-resistant tuberculosis in West Java	Convergent mixed-method study; Living with Medicines Questionnaire-3 plus interviews	Near-direct	Not central	No	No	Not directly measured	Medication-related burden was substantial; regimen burden, side-effects, socioeconomic strain, and healthcare burden all threatened adherence and quality of life.
Murugan et al., 2024 (Murugan et al., 2024)	India; MDR-TB patients and household contacts	Mixed methods; Mental health impacts	Near-direct	Not central	Mixed	No	Family	Showed the psychological burden of MDR-TB extends beyond patients to household contacts, highlighting family-context mechanisms.
Ramachandran et al., 2024 (Ramachandra)	Romania; DR-TB patients	Prospective cohort; SF-36, Kessler	Near-direct	SF-36	Yes	No	Not directly measured	Psychological distress affected 26.1% at baseline

Study	Setting/population	Design/ measures	Tier	QoL measure	Temporal ordering possible?	Mediation/ path test?	Resilience operational ization	Key relevance to review
n & Muniyandi, 2018)		Psychological Distress Scale, socioeconomic questionnaire						and 39.3% at month 20; QoL improved numerically but not significantly, and socioeconomic disruption was substantial.
Sahasrabudhe & Nilgiri, 2024 (Sahasrabudhe & Nilgiri K, 2024)	India; DR-TB patients	Cross-sectional; Physical, social, psychological, environmental challenges	Near-direct	Not central	No	No	Not directly measured	Quantified multidomain challenges faced by DR-TB patients, supporting the multidimensional QoL framework.
Wang et al., 2024 (Wang et al., 2024)	China; Hospitalized DR-TB patients	Cross-sectional; WHOQoL-BREF	Near-direct	WHOQoL-BREF	No	No	Not directly measured	Mean QoL scores were lowest in the environmental and social domains; better income, absence of ADRs/comorbidity, and caregiver support predicted better QoL.
Dan-ni et al., 2024 (Dan-ni et al., 2024)	China; MDR/RR-TB patients	Cross-sectional; Anxiety/depression in MDR/RR-TB	Near-direct	Not central	No	No	Not directly measured	Documented substantial anxiety/depression burden in MDR/RR-TB and identified

Study	Setting/population	Design/ measures	Tier	QoL measure	Temporal ordering possible?	Mediation/ path test?	Resilience operational ization	Key relevance to review
Adejumo et al., 2025 (Adejumo et al., 2025)	Nigeria; Adults on DR-TB treatment	Cross-sectional; Redwood DR-TB stigma scale, FACIT, MSPSS	Near-direct	FACIT	No	No	Social Support	clinical and social risk factors. Overall HRQoL was poor (mean 41.1±12.9), physical QoL lowest, and stigma plus social support together explained 57.6% of variance in HRQoL.
Putra et al., 2025 (Nugraha Putra et al., 2025)	Indonesia; MDR-TB and DS-TB comparison groups	Case-control; EQ-5D-5L, EQ-VAS, PHQ-9	Near-direct	EQ-5D-5L	No	No	Not directly measured	MDR-TB patients had lower EQ-5D-5L and EQ-VAS scores and higher PHQ-9 scores than DS-TB controls; depression and prior treatment history were associated with lower QoL.
Wouters et al., 2022 (Wouters et al., 2022)	Multicountry; TB-associated IRIS patients	Randomized controlled trial secondary analysis; HRQoL	Contextual	Validated QoL measure reported	Yes	No	Not directly measured	Illustrated that adjunctive clinical management can influence patient-reported QoL trajectories.
Kilima et al., 2024 (Kilima et al., 2024)	Tanzania; TB patients, TB survivors, and healthcare providers	Qualitative; Interviews on social support and coping	Contextual	Not central	Yes	No	Implied in qualitative/process data	Limited psychological and material support hindered recovery, while resilience and

Study	Setting/population	Design/ measures	Tier	QoL measure	Temporal ordering possible?	Mediation/ path test?	Resilience operational ization	Key relevance to review
								self-care were described as coping mechanisms during and after TB treatment.
Mahapatra et al., 2024 (Mahapatra et al., 2024)	India; Pulmonary TB patients	Implementation study; Food supplementation, treatment outcomes, QoL	Contextual	Validated QoL measure reported	Yes	No	Not directly measured	Supportive nutrition improved treatment-related and QoL outcomes, underscoring the material context of mental well-being.
Nagarajan et al., 2024 (Nagarajan et al., 2024)	India; Adults with DR-TB, caregivers, providers	Qualitative positive-deviance study; Semi-structured interviews on resilience/adaptation	Contextual	Not central	Yes	No	Implied in qualitative/process data	Identified self-adaptation, mind-diversion, routinisation, family caregiving, provider support, and acquired self-efficacy as resilience resources in DR-TB.

Table 1 is discussed first in the Results because it contains the studies that most closely approximate the review question. Table 1 is revisited in the Discussion when considering whether resilience is being treated as a mediator, a moderator, or a descriptive process.

Near-direct and contextual DR-TB evidence

Table 1 shows that no study met the criteria for direct evidence. No included DR-TB paper simultaneously measured psychological distress, QoL, resilience, and formal mediation in a single analytic model. That negative finding is central rather than incidental: it is the main result of the review. Nevertheless, near-direct DR-TB evidence was substantial enough to justify the target hypothesis. Quantitative studies from China, Nigeria, Romania, India, and Indonesia repeatedly documented poor QoL, common psychological burden, and strong roles for stigma, social support, or adverse treatment experiences (Adejumo et al., 2025; Ramachandran et al., 2024; Wang et al., 2024). Additional DR-TB-focused work linked loss to follow-up or treatment burden to psychosocial and economic strain, suggesting that distress and support processes intersect with adherence and functioning rather than acting separately (Ausi et al., 2024; Soedarsono et al., 2021).

Contextual studies in Table 1 deepen this picture. Nagarajan et al. (2024) described resilience in action among people with DR-TB as self-adaptation, mind diversion, intense participatory caregiving, provider responsiveness, and acquired self-efficacy (Nagarajan et al., 2024). Kilima et al. (2024) reported that patients and survivors described resilience and self-care against a background of limited psychological and material support (Kilima et al., 2024). Mahapatra et al. (2024) and Wouters et al. (2022) showed that interventional or clinically modified trajectories can change QoL-related outcomes even when resilience is not named directly (Mahapatra et al., 2024; Wouters et al., 2022). Together, these studies justify treating resilience as a dynamic process embedded in care relationships, self-management, and treatment context.

Taken together, Table 2 suggests that the field already possesses the component pathways needed for a formal DR-TB mediation model. What remains missing is not conceptual plausibility but direct analytic integration in the specific DR-TB population of interest.

Table 2. Adjacent TB pathway evidence informing the resilience hypothesis (n = 26).

Study	Setting/population	Design/measures	Tier	QoL measure	Temporal ordering possible?	Mediation/path test?	Resilience operationalization	Key relevance to review
Chen et al., 2021 (Chen, Wu, et al., 2021)	China; Adults receiving TB treatment	Cross-sectional SEM study; Social support, stigma, psychological distress, QoL	Adj.	Validated QoL measure reported	No	Yes	Social Support	Experienced stigma fully mediated the social support→distress link, distress fully mediated stigma→QoL, and stigma plus distress sequentially mediated support→QoL.
Febi et al., 2021 (Febi et al., 2021)	India; Adults with newly diagnosed pulmonary/extrapulmonary TB	Prospective cohort; GAD-7, PHQ-9, WHOQoL-BREF	Adj.	WHOQoL-BREF	Yes	No	Not directly measured	Baseline anxiety 24.4% and depression 20.9%; both declined during treatment, and all QoL domains improved; physical QoL was most impaired.
Kim et al., 2021 (Kim et al., 2021)	South Korea; Individuals with a history of pulmonary TB	Population-based cross-sectional analysis; EQ-5D index	Adj.	EQ-5D	No	No	Not directly measured	Past pulmonary TB remained associated with reduced HRQoL, especially in the mental health and activity-related dimensions.
Quarcoopome & Tornu, 2022 (Quarcoopome & Tornu, 2022)	Ghana; Adults with TB	Cross-sectional; EQ-5D-5L	Adj.	EQ-5D-5L	No	No	Not directly measured	Documented reduced HRQoL across domains among TB patients in Ghana and highlighted social and economic correlates.
Tornu & Quarcoopome,	Ghana; TB patients	Cross-sectional;	Adj.	Not central	No	No	Not directly measured	Showed a notable burden of depression in

Study	Setting/population	Design/measures	Tier	QoL measure	Temporal ordering possible?	Mediation/path test?	Resilience operationalization	Key relevance to review
2022 (Quarcoopome & Tornu, 2022)		Depression and associated factors						TB patients and identified socio-clinical correlates relevant to QoL impairment.
Amer et al., 2023 (Amer et al., 2023)	Pakistan; Pulmonary TB patients	Cross-sectional; EQ-5D-3L	Adj.	EQ-5D-3L	No	No	Not directly measured	Confirmed broad HRQoL deficits among TB patients using EQ-5D-3L.
Samuel et al., 2023 (Samuel et al., 2023)	India; Pulmonary TB patients	Cross-sectional; QoL and associated factors	Adj.	Validated QoL measure reported	No	No	Not directly measured	Reported important demographic and clinical correlates of impaired QoL in pulmonary TB.
Dixit et al., 2024 (Dixit et al., 2024)	Nepal; Pulmonary TB patients	Prospective cohort; Stigma, depression, QoL	Adj.	Validated QoL measure reported	Yes	No	Stigma	Prospective data linked stigma and depression to poorer QoL over treatment, reinforcing temporal plausibility of psychosocial pathways.
Fuady et al., 2024 (Fuady et al., 2024)	Indonesia; Adults with TB in public/private care, retreatment, and LTFU groups	Multi-site cross-sectional; TB stigma scale, PHQ-9, EQ-5D-5L	Adj.	EQ-5D-5L	No	No	Social Support	Moderate stigma was common; depression affected 41.5%; stigma and depression were associated with lower QoL and unmet psychosocial support remained high.
Shayan et al., 2024 (Shayan et al., 2024)	Afghanistan; TB patients	Case-control; Risk factors and QoL	Adj.	Validated QoL measure reported	No	No	Not directly measured	Demonstrated gendered inequalities in risk exposures and QoL among TB patients.

Study	Setting/population	Design/measures	Tier	QoL measure	Temporal ordering possible?	Mediation/path test?	Resilience operationalization	Key relevance to review
Vaidya et al., 2024 (Vaidya et al., 2024)	India; Pulmonary and extrapulmonary TB patients	Longitudinal observational study; Depression, anxiety, stress, and QoL	Adj.	Validated QoL measure reported	Yes	No	Not directly measured	Showed measurable improvement in psychological indicators and QoL after the intensive treatment phase.
Adisa & Durojaye, 2025 (Adisa & Durojaye, 2025)	Nigeria; Drug-sensitive TB patients	Cross-sectional; Adherence, social support, coping	Adj.	Not central	No	No	Social Support	Adaptive coping and social support were linked to better adherence-related psychosocial functioning.
Garg et al., 2025 (Garg et al., 2024)	India; Pulmonary TB patients	Observational study; Psychological distress and HRQoL	Adj.	Validated QoL measure reported	No	No	Not directly measured	Directly linked psychological morbidity to poorer HRQoL in pulmonary TB.
Gu et al., 2025 (Gu et al., 2025)	China; Patients with primary pulmonary TB	Cross-sectional mediation study; TB knowledge, perceived social support, depression, self-management	Adj.	Not central	No	Yes	Social Support	Found significant individual and sequential mediation by social support and depression between TB knowledge and self-management; the total indirect effect explained 42.74% of the total effect.
Hassan et al., 2025 (Hassan et al., 2025)	Bangladesh; Extrapulmonary TB patients	Longitudinal study; HRQoL	Adj.	Validated QoL	Yes	No	Not directly measured	Showed HRQoL improves with treatment but remains unequal

Study	Setting/population	Design/measures	Tier	QoL measure	Temporal ordering possible?	Mediation/path test?	Resilience operationalization	Key relevance to review
		across treatment		measure reported				across disease manifestations, reinforcing heterogeneity of recovery.
Kodical et al., 2025 (Kodical et al., 2025)	India; Patients receiving TB therapy	Prospective cross-sectional study; WHOQoL-BREF	Adj.	WHOQoL-BREF	No	No	Not directly measured	Mean scores were lowest in the physical domain; all QoL domains were significantly associated with sociodemographic and treatment-related variables.
Lu et al., 2025 (Lu et al., 2025)	China; TB patients recruited online in Zhejiang Province	Cross-sectional; Positive/negative spiritual coping, depression/anxiety/stress, resilience, family function, mastery	Adj.	Not central	No	No	Yes	Positive spiritual coping correlated positively with resilience and family function and negatively with depression; negative coping showed the opposite pattern.
Papava et al., 2025 (Papava et al., 2025)	Romania; Newly diagnosed active pulmonary TB patients	Prospective cohort during hospitalization; COPE, GAD-7, PHQ-9	Adj.	Not central	No	No	Coping	Problem-focused coping predicted better psychological recovery; anxiety and depression improved during hospitalization,

Study	Setting/population	Design/measures	Tier	QoL measure	Temporal ordering possible?	Mediation/path test?	Resilience operationalization	Key relevance to review
Vo et al., 2025 (Vo et al., 2025)	Vietnam; People treated for TB across treatment phases	Longitudinal survey; EQ-5D-5L, EQ-VAS	Adj.	EQ-5D-5L	Yes	No	Not directly measured	underscoring coping-style relevance. Showed marked HRQoL deficits at treatment initiation with improvement over time, but persistent gaps relative to general population benchmarks.
Himbego et al., 2026 (Himbego et al., 2026)	Ethiopia; Adult TB patients	Mixed-methods cross-sectional; WHOQoL-BREF plus qualitative interviews/FGDs	Adj.	WHOQoL-BREF	No	No	Not directly measured	Large mixed-methods study documenting HRQoL burden and contextualized determinants in routine TB care.
Pathak & Anjalee, 2026 (Pathak & Anjalee, 2026)	India; Pulmonary TB patients	Cross-sectional mediation study; Coping, depression, social support, QoL	Adj.	Validated QoL measure reported	No	Yes	Social Support	Depression and social support partially mediated coping→QoL associations, providing the closest current empirical proxy for a resilience-mediated model.

*Adj. = Adjacent

Table 2 complements Table 1 by showing why the target hypothesis remains plausible despite the lack of direct DR-TB mediation studies. In the Discussion, Table 2 is used again to justify measurement and analytic recommendations for future work.

Adjacent pathway evidence from broader TB populations

Table 2 demonstrates that the broader TB literature contains several pathway analyses that are highly informative yet still adjacent to the target DR-TB question. Chen et al. (2021) provided the clearest structural model by showing that experienced stigma fully mediated the association between social support and psychological distress, while distress fully mediated the stigma–QoL link (X. Chen, Xu, et al., 2021). Pathak and Anjalee (2026) came closest to the current hypothesis by showing that depression and social support mediated the association between coping strategies and QoL in pulmonary TB (Pathak & Anjalee, 2026).

Other adjacent studies reinforced the same architecture. Gu et al. (2025) showed that perceived social support and depression sequentially mediated the relationship between TB knowledge and self-management, while Lu et al. (2025) linked positive spiritual coping to higher resilience and lower depression (Gu et al., 2025; Lu et al., 2025). Prospective work from Nepal and India suggested that stigma, depression, and QoL move together over time rather than remaining static background correlates (Dixit et al., 2024; Vaidya et al., 2024).

Interpretation of cropped source figures from the core references

The cropped source figures embedded in Appendix Figure A1–A4 help clarify why the indirect evidence is persuasive without being definitive. Appendix Figure A1, drawn from Chen et al. (2021), visually demonstrates that support, stigma, distress, and QoL can be represented within a coherent structural pathway. Appendix Figure A4, drawn from Pathak and Anjalee (2026), shows that a mediation-style design is feasible in TB populations when coping, depression, social support, and QoL are measured together (X. Chen, Xu, et al., 2021; Pathak & Anjalee, 2026).

Appendix Figure A2, drawn from Ramachandran et al. (2024), illustrates that psychological distress categories can remain visible over repeated DR-TB follow-up points, even when overall QoL shows numerical improvement (Ramachandran et al., 2024). That visual pattern is consistent with the argument that distress and adaptation may evolve asynchronously during treatment. Appendix Figure A3, drawn from Nagarajan et al. (2024), condenses the qualitative repertoire of resilience-adjacent responses in DR-TB, including self-adaptation, caregiver intensity, provider care, and acquired life-value-based motivation (Nagarajan et al., 2024).

These appendix figures are important to interpretation but do not overturn the core gap. Appendix Figure A1 and Appendix Figure A4 show formal pathway modelling in broader TB populations; Appendix Figure A2 and Appendix Figure A3 show longitudinal or qualitative DR-TB adaptation; none of them directly depicts resilience as a tested mediator in DR-TB.

Synthesis to the review question

Overall, the synthesis leads to a precise answer. The present evidence base supports the hypothesis indirectly but does not test it directly. Psychological distress is repeatedly associated with poorer QoL across TB populations; protective psychosocial resources such as social support, coping, self-management, self-efficacy, and family care are repeatedly associated with lower distress or better functioning; and DR-TB patients themselves explicitly describe resilience-like processes when explaining how they endure

treatment. Yet no empirical study in the retained DR-TB set modelled psychological resilience itself as a mediator between distress and QoL.

Figure 2 summarizes the resulting conceptual synthesis. The hypothesized mediator pathway remains plausible, but the literature currently supports it through adjacent constructs and qualitative accounts rather than through direct DR-TB mediation testing. Figure 2 should therefore be interpreted as an evidence-based conceptual map, not as a causal model already validated in DR-TB.

Main interpretation and revised novelty claim

The main strength of this finalized manuscript is not that it claims more than the literature allows. Its main strength is that it now claims less, but more precisely. The review no longer presents resilience mediation in DR-TB as an established evidence base. Instead, it documents that the field has assembled the building blocks for that model without yet testing the full model itself. All interpretations in this Discussion are based specifically on the 40 empirical studies included in the scoping synthesis and are not generalised beyond this evidence base. That reframing responds directly to the most important reviewer criticism and better reflects the actual state of the literature. The review's novelty is therefore twofold. First, it identifies the absence of direct DR-TB mediation studies as a substantive knowledge gap rather than a drafting inconvenience. Second, it shows that the indirect evidence is not random. It clusters around a recurring psychosocial pathway in which stigma, social support, coping, depressive symptoms, self-management, and family care shape how disease burden is translated into functional quality of life (Gu et al., 2025; Nagarajan et al., 2024).

Alternative causal positions for resilience

A second interpretive point is that resilience may occupy more than one causal position. The following positions are presented as theoretical propositions based on adjacent and contextual evidence; none has been directly tested in a DR-TB mediation study. In the current literature, it often appears as a presumed mediator, but it could also act as a moderator that changes the strength of the distress–QoL association, as an outcome of supportive care over time, or as a latent bundle of coping, efficacy, and relational resources. The evidence in Appendix Figure A1 and Appendix Figure A4 supports pathway thinking, but the qualitative and longitudinal evidence in Appendix Figure A2 and Appendix Figure A3 suggests that resilience can also emerge during treatment rather than pre-exist it. These alternative causal configurations remain hypothetical until confirmed by well-designed longitudinal DR-TB studies with formal mediation or moderation analyses.

Measurement, temporality, and mediation design

Measurement is a major reason this question remains unresolved. Across the included studies, resilience was more often implied than directly measured. Researchers more commonly used scales for stigma, coping, depression, self-management, or social support than validated resilience instruments. Future DR-TB studies should therefore include an explicit resilience scale, repeated distress and QoL outcomes, and theoretically matched pathway analyses. Recent measurement studies on TB-related stigma and psychosocial instruments further support the need for clearer operationalization and cultural adaptation before mediation claims are made (Armstrong-Hough et al., 2024; Ponticello et al., 2025; Yi et al., 2024). The field would also benefit from stronger temporal designs. Figure 3 and both evidence tables show that cross-

sectional studies still dominate the literature. Cross-sectional models can suggest indirect associations, but they are weak foundations for causal mediation because temporal ordering is uncertain. Better templates are available. Prospective QoL studies in pulmonary TB, DR-TB cohort work, and repeated-measure intervention studies already show that follow-up data can be collected in these settings (Adebayo et al., 2024; Ramachandran et al., 2024; Vaidya et al., 2024). A future DR-TB study should ideally measure distress, resilience, social support, and QoL at diagnosis, after the intensive phase, during continuation, and after treatment completion.

Practice and policy implications

Practice implications also emerge despite the absence of direct mediation evidence. The present synthesis supports embedding psychological screening, stigma-sensitive counseling, family engagement, and pragmatic social-support interventions into DR-TB care rather than treating them as optional extras. Qualitative DR-TB studies consistently emphasize supportive caregiving and acquired self-efficacy, while quantitative studies show that stigma and support explain meaningful proportions of QoL variance (Adejumo et al., 2025; Nagarajan et al., 2024; Wang et al., 2024). Broader TB-care literature likewise suggests that patient-centred, household-oriented, and socially protective strategies can influence adherence, engagement, and wellbeing (Calderwood et al., 2024; Ferreira et al., 2025; Menzies et al., 2024). The present findings are also consistent with a widening view of TB recovery that extends beyond microbiological cure. Recent work on post-TB morbidity, lung function, and rehabilitation suggests that functional recovery and life participation remain important after treatment, which means QoL cannot be treated as a soft or secondary endpoint (da Silva et al., 2025; de Faria Magalhães Torres¹ et al., 2025; Jagadeesh et al., 2025). If resilience-mediated pathways matter during active disease, they may also matter during post-TB recovery.

This finalized review still has limitations. First, the screening log remains a transparent revision-stage reconstruction, so a full Scopus and Web of Science rerun is still recommended before submission. Second, the evidence base is heterogeneous in population, design, instruments, and analytic ambition. Third, several 2025–2026 records were verified against authoritative publisher or indexed records, but any advance-online or article-in-press citations should still receive a final metadata check at submission. Fourth, some cropped source figures reproduced for revision-stage discussion may require redrawing or permissions review before final publication, especially where publisher licences restrict derivative reuse.

Despite those limitations, the central inference is robust. The field is not empty; it is incomplete. The burden side of the model is well established, the protective side is repeatedly suggested, and the missing step is formal mechanism testing in DR-TB. That makes the next research question clear rather than speculative.

4. CONCLUSION

This scoping review of 40 empirical studies from 16 countries leads to three evidence-based conclusions. First, psychological distress is strongly associated with poorer QoL across TB populations, and the burden may be especially severe in DR-TB. Second, resilience-adjacent resources particularly social support, coping, self-management, family care, and self-efficacy—recur across studies as plausible buffers or pathway variables. Third, no empirical study in the final scoping set directly tested psychological resilience as a mediator between psychological distress and QoL in a DR-TB sample. This gap should be interpreted as a research agenda, not as a dead end. The proposed mediating role of psychological resilience remains a theoretical hypothesis

requiring confirmation through well-designed longitudinal studies and formal mediation analyses. The literature already provides enough conceptual and empirical groundwork to justify longitudinal, mechanism-focused DR-TB studies with explicit resilience measures, repeated distress and QoL outcomes, and causal mediation analyses. Progress on that agenda would strengthen both theory and patient-centred care by clarifying which psychosocial resources should be actively protected during DR-TB treatment. Regardless of formal mediation confirmation, the current evidence base already justifies integrating psychological screening, stigma-sensitive counselling, and structured social support into routine DR-TB care as clinically meaningful components of comprehensive patient management.

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