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Feasibility of integrating depression care into tuberculosis services in India

Thekkumkara, Sreekanth; Shree, Vidhya; Adhikary, Anoshmita; Todowede, Olamide; Dahale, Ajit Bhalchandra; Muliya, Krishna Prasad

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- Tuberculosis (TB) is a communicable disease that contributes significantly to the healthcare burden, particularly in low- and middle-income countries (LMICs). India accounts for 26% of the world's TB cases, making its eradication a primary public health goal.
- Co-morbid depression has a negative impact on the treatment outcomes and the quality of life of individuals with TB.
- This study is among the first in India and the region to assess the feasibility of integrating depression care within the existing TB services.
- The study highlights the need for implementing depression care and the method of integrating that within the existing TB care in India. The study's findings propose the need for further scaling up and implementing the model. If proven effective, the National Tuberculosis Elimination Programme of India could adopt this model to enhance training, identification, and the delivery of appropriate depression care for individuals with TB.

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Title page

Title of the study: Feasibility of integrating depression care into Tuberculosis services in India.

Authors: Sreekanth Thekkumkara ^{2&1}, Vidhya Shree², Anoshmita Adhikary², Olamide Todowede^{3&6}, Ajit Bhalchandra Dahale², Krishna Prasad Muliya², Akshata JS⁵, Santosh Kumar Chaturvedi², Pratima Murthy², Najma Siddiqi^{3&4}, Geetha Desai².

1. School of Health Sciences, University of Dundee, Dundee, United Kingdom
2. Department of Psychiatry, National Institute of Mental Health and Neurosciences (NIMHANS), Bengaluru, India
3. Department of Health Sciences and Hull York Medical School (HYMS), University of York, Heslington, United Kingdom
4. Bradford District Care NHS Foundation Trust (BDCFT), Bradford, United Kingdom
5. Department of Pulmonary Medicine, SDSTRC and Rajiv Gandhi institute of chest diseases, Bengaluru, India.
6. School of Health Sciences, University of Nottingham, United Kingdom

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Corresponding author:

Dr Geetha Desai

Professor of Psychiatry

Department of Psychiatry, National Institute of Mental Health and Neurosciences (NIMHANS)

Bengaluru, 560029

Karnataka, India

Email: desaigeetha@gmail.com

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Conflict of interest statement

The authors declare that they have no conflicts of interest.

Ethics approval

The study was approved by the Institute Ethics Committee of the National Institute of Mental Health and Neurosciences (NIMHANS), Bangalore, India (NIMHANS/28th IEC (BEH.SC.DIV.)/2020-21) and by the University of York Health Sciences Research Governance Committee (HSRGC/2020/418/D). Permission was also obtained from the Health Ministry Screening Committee, Government of India (HMSC 2021--0116) and the Department of Health, Government of Karnataka.

Author contributions

ST: project administration, data collection, analysis and interpretation and manuscript preparation. VS & AA: project administration, data collection, OT, NS developed the study protocol, NS, OT, GD, KP, SKC, PM conception and design of protocol and workshop guide. All authors: Drafting, revision and finalisation of the manuscript.

Feasibility of Integrating Depression Care into Tuberculosis Services in India.

1. Introduction

Tuberculosis (TB) remains one of the leading causes of the global burden of disease and is a significant contributor to deaths worldwide (Chakaya et al., 2021; Siapka et al., 2020; Stubbs et al., 2021; WHO, 2021). TB affects the most vulnerable people in society and is closely associated with poverty and other socioeconomic disadvantages (Bhargava et al., 2021). Target 3.3 of the Sustainable Development Goals (SDGs) has aimed for a 90% reduction in the number of TB deaths and an 80% reduction in TB incidence by 2030, a 90% reduction in TB incidence and a 95% reduction in mortality related to TB by 2035 (Lönnroth & Raviglione, 2015). India alone contributes 26% of the worldwide TB incidence, whereas South Asia contributes to 44% of the worldwide TB cases (Chakaya et al., 2021; Organization World Health, 2020).

Studies have reported high rates of mental illness among persons with TB (Doherty et al., 2013; Hayward et al., 2022). South Asian countries have a greater prevalence of comorbid mental illness and TB than other LMICs do (Doherty et al., 2013). Researchers have observed a bidirectional relationship between TB and mental illness. Both share common risk factors, including homelessness, HIV-positive status, alcohol and tobacco use and migrant status, leading to frequent comorbidities (Zhang et al., 2019). South Asian countries reported a high rate of depression among people with TB. The prevalence of depression is reported to be 20–50% in India (Chandra et al., 2019). In addition, studies have reported an increased prevalence of depression among those with multidrug-resistant tuberculosis (Das et al., 2014; Dawar et al., 2016; Veeraraghavan & Srinivasan, 2021).

Poverty, social vulnerability, poor awareness, lack of access to integrated mental health care and societal stigma have been noted to contribute to depression among people with TB (Chandra et al., 2019; Sweetland et al., 2017). Studies have documented psychiatric comorbidities secondary to the side effects of anti-TB medications (Akshata et al., 2015;

Knight et al., 2019; Mendenhall et al., 2017; Nilamsari et al., 2021; Prasad et al., 2019). The symptoms of depression among persons with TB can lead to poor care-seeking for their condition and poor adherence to TB treatment, leading to drug resistance, morbidity and mortality (Hayward et al., 2022; Sweetland et al., 2017). Similarly, depression contributes to an increased risk of TB, which is partly mediated by changes in the immune system or poor self-care secondary to depression(Stubbs et al., 2021).

Evidence-based treatments for depression are available that could also potentially improve outcomes for patients with coexisting TB. Despite this, the identification and treatment of depression are routinely lacking (Stubbs et al., 2021). Early screening, recognition and treatment of depression in TB patients have the potential to improve TB outcomes by enhancing motivation and treatment adherence (Farooq et al., 2021; Janse Van Rensburg et al., 2020). For these reasons, there are growing calls for routine screening, detection and treatment of depression in people with TB. However, a significant barrier to early screening and recognition is the shortage of mental health specialists—a global problem accentuated in the LMIC (Nava-Ruelas et al., 2024). To address this capacity gap, researchers have proposed ‘task shifting’ or ‘task sharing’, training nonspecialist healthcare staff to take on roles and deliver treatments traditionally delivered by specialists (Hoeft et al., 2018; Mafigiri et al., 2012).

TB healthcare services are relatively well established in LMICs (Behera et al., 2022; Farooq et al., 2021; Kelamane et al., 2021; Padayatchi et al., 2019). In India, the National TB Elimination Programme (NTEP), the world’s largest TB control programme (*National Tuberculosis Elimination Programme*, n.d.), delivers decentralised services for TB with the vision of prevention, detection, and treatment, emphasising universal coverage and social protection (Padmapriyadarsini et al., 2021; Zaman, 2021). The programme has extended TB services even at the grassroots level by involving health workers at the community level (Behera et al., 2022; Gadicherla et al., 2020). This presents an opportunity to build on these

relatively well-resourced services to codesign and integrate the treatment of depression, using a task shifting/sharing approach by non-mental health specialist staff, such as TB health workers, medical officers and other health professionals, who could be trained to recognise, treat or provide referrals (Janse Van Rensburg et al., 2020).

1.1.Aim and objectives of the study.

This study aimed (a) to co-design and develop culture- and context-appropriate approaches to case finding and treatment of depression integrated with tuberculosis care (including developing pathways and materials) that can be delivered by non-mental health specialists and (b) to test the feasibility in real-world TB service settings to identifying cases of depression in tuberculosis services (in terms of coverage, referral and acceptability to patients and healthcare staff).

2. Methods

2.1.Design

The Medical Research Council (MRC) framework for complex interventions (Craig et al., 2013; Skivington et al., 2021) and framework for interventions, adaptation (Escoffery et al., 2019) and multimorbidity interventions (Smith et al., 2013) was followed for designing and evaluating the intervention. We co-developed a tailored depression care pathway through a series of co-design workshops using a participatory approach. Research findings suggest that co-design approaches in service delivery pathways have the potential to enhance service quality, delivery, and patient satisfaction. Furthermore, they promote equitable partnerships with service users. For these reasons, we adopted a co-design approach in this study. The care pathway was implemented across the three facilities over 12 months. We evaluated its acceptability to stakeholders and feasibility in a TB setting through a mixed-methods feasibility study design, collecting quantitative data on the completeness of screening, rates of depression,

referrals for treatment, and feedback from workshops with healthcare staff, people with TB, and their caregivers.

2.2.Settings and population:

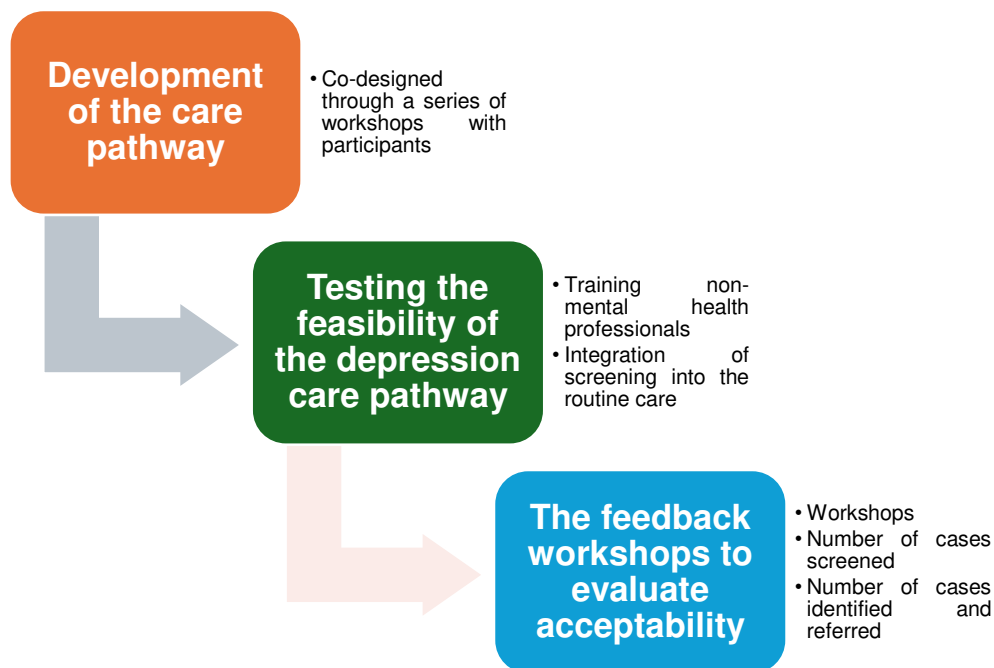
This study is part of the chronic communicable disease study nested within the IMPACT (Improving Mental and PhysiCal Health Together in South Asia) programme (*Welcome to the Centre for IMPACT*, n.d.), which aims to integrate depression care within TB services in India, Bangladesh and Pakistan. This paper presents the study findings from India. The study was carried out at three TB treatment centres: a primary care centre (PHC), an urban community health centre (CHC) and a tertiary healthcare facility (in Bengaluru, Karnataka, India). The primary health care centre caters for the needs of around 80-100 patients per year with TB and the community health centre provides services to around 120-140 patients per year with TB. The tertiary care setting receives TB referrals from districts and other states and self-reported patients; predominantly, it caters services for the complex and drug-resistant cases. The study included all adults aged 18 years and over who attended the three facilities with a diagnosis of drug-sensitive pulmonary and extrapulmonary TB using the consecutive sampling technique. Patients with drug-resistant TB and paediatric TB who receive care in different health settings (for which the treatment pathways are significantly different) were excluded in this study.

The development of the depression care pathway and feedback workshops involved two groups of participants: (1) staff delivering the care pathway (the healthcare staff involved in delivering the care pathway) and (2) service users (patients offered the pathway and their carers). In both stages, all staff involved in TB care, including pulmonologists, general physicians and pathologists, medical officers (MOs), senior TB laboratory supervisors (STLSs), TB health visitors (TBHVs), and senior treatment supervisors (STs) from all three study centers, were invited to the service providers' interviews. These workshops were

conducted with a mixed population to generate maximum ideas based on the practice experience of each healthcare staff member involved in TB care. A convenience sampling method was used to recruit service users and patients with TB and their carers. The research team translated the patient information sheet and consent form into the regional language (Kannada) and then gave them to the participants. Written informed consent was obtained from all participants. For participants who were not formally educated, a thumb impression was taken, along with an additional witness signature. Participants could withdraw from the study at any stage without affecting their ongoing treatment, and researchers informed them of this right.

2.3.Study process

The study was conducted in three stages,



2.4.Development of the care pathway

The integrated TB and depression care pathway was co-created through a series of co-design workshops (n = 9) with stakeholders across TB and mental health care services, including persons with TB, their caregivers, and healthcare providers from all three centres in Bengaluru,

India (Todowede et al., 2023). The workshop included a presentation in lay language, which provided an overview of depression and TB. A workshop guide developed for the facilitators to outline the format guided the open and small group discussions. The workshop guide included questions and prompts that were used to explore existing care pathways, identify the components required to develop integrated pathways, and gather any further suggestions. The facilitators of the workshops were experienced and trained to present and share information via open-ended, leading and probing questions.

Workshops were held separately for health professionals and people with TB to minimise power dynamics and gather maximum information from all stakeholders. The participants had sufficient time to express their views and opinions on the questions, ensuring mutually respectful and inclusive participation. Summaries of workshop information were provided to participants at the end of each session, for agreement and clarification requests. The suggestions from the workshops were used to refine the depression care pathway in TB treatment. The framework of the pathway was adapted from the World Health Organisation (WHO) mhGAP intervention guide(Health & Action, 2008). The completed pathway (Figure 1) was further reviewed and approved.

2.5. Testing the feasibility of the depression care pathway:

The training was provided, and the pathways of care (Figure 1) were discussed with the health professionals involved in TB healthcare at these study centres. The training was provided based on the WHO's mhGAP module(Health & Action, 2008), which includes content for non-mental health specialists to provide mental health support to these patients. The training provided the with a brief counselling outline that included information about depression, signs and symptoms, interview skills, basic counselling techniques, counselling skills, and information on depression care including medication and side effects. We have trained participants to administer PHQ2& PHQ9 (Kroenke et al., 2001) for screening of the people with TB. We

chose these scales because they are validated in the Kannada language (Dutta et al., 2025; Kochhar et al., 2007) and easy to administer in similar clinical settings compare to other depression screening tools. Post completion of the training, during the feasibility phase, a regular telephone follow-up was conducted by the research team with trained health professionals to provide hand-hold support for any challenges while screening and referring people with TB for depression care during the process. Three experienced psychiatrists (including GD, KPM and another psychiatrist) from NIMHANS conducted the training sessions. The training duration was 3 hours for each session.

The feasibility testing focused on the appropriateness and acceptability of the integrated care pathway to patients, carers and healthcare staff. The study assessed key areas of feasibility, such as the use of screening tools in select healthcare centres and the feasibility of the depression care pathway, by analysing the proportion of people screened by trained health professionals across the centres and the number of identified cases referred for further evaluation and depression care. Every adult patient who consented and visited the three study sites during the study period was screened for depression, regardless of previous depression status, by trained service providers. Community health centre cases were referred to nearby community mental health centres or the District Mental Health Programme team for patient referrals. Referrals from the tertiary study centre went to the National Institute of Mental Health and Neurosciences (NIMHANS), the closest tertiary mental healthcare facility.

2.6.The feedback workshops to evaluate acceptability.

The participants involved in this phase were the staff delivering the care pathway (the healthcare staff involved in providing the care pathway) and service users (patients offered the pathway and their carers). Three feedback workshops were conducted to understand the facilitators, barriers, and experiences during the process of implementing depression care

pathways and future recommendations. Each feedback workshop included five to seven participants. The data were collected between June 2021 and June 2022.

2.7.Quantitative data

The data collection tools provided to the staff delivering care included (1) informed consent forms and study information, (2) screening sheets, (3) screening tools (PHQ-2 & PHQ-9), (4) sociodemographic questionnaires and (5) referral sheets. The research staff made regular visits to the centres to collect completed assessments. All the quantitative data were entered into an online survey tool (Qualtrics) by the research assistant.

2.8.Qualitative data

We used a semi-structured topic guide during the workshops to gather qualitative data for the co-design and feedback phase. The facilitator (research assistant and research fellow) used prompts to explore further information and cover comprehensive details in each phase. The researchers conducted the workshops in the local language (Kannada) and held them face-to-face, taking all necessary safety precautions during the COVID-19 pandemic. All discussions were audio-recorded, and narrative notes were taken to ensure that no relevant information was missed.

2.9.Data analysis

The quantitative data were analysed via the licensed Statistical Package for the Social Sciences (SPSS) 23 software. A descriptive analysis was conducted on the sociodemographic data of the participants via means and standard deviations. Frequencies and percentages were used for the categorical data.

A thematic analysis framework was used for the qualitative analysis via Braun and Clarke's 6-stage analytical method (Braun & Clarke, 2006). Transcribing the audio-recorded data was done by a research assistant (RA) and Research Fellow (RF) conducted random checks of the validity of transcripts by comparing them to the audio recordings. Two researchers (RA and

RF) coded all the interviews separately, followed by cross-coding to ensure consistent coding practices. In the event of discrepancies, the research lead (GD) was involved in resolving them. All the data were stored in a digital format on a password-protected device, and access was granted only to the research team (RA, RF, and GD). NVivo software was used to analyse the qualitative data.

2.10. Patient and public involvement

A community advisory panel, comprising patients, TB survivors, caregivers, and members of advocacy groups, ensured community, patient, and public involvement in the research. The group was involved in planning and reviewing the study progress, formulating topic guides and depression care pathways and providing advice on their feasibility.

3. Results

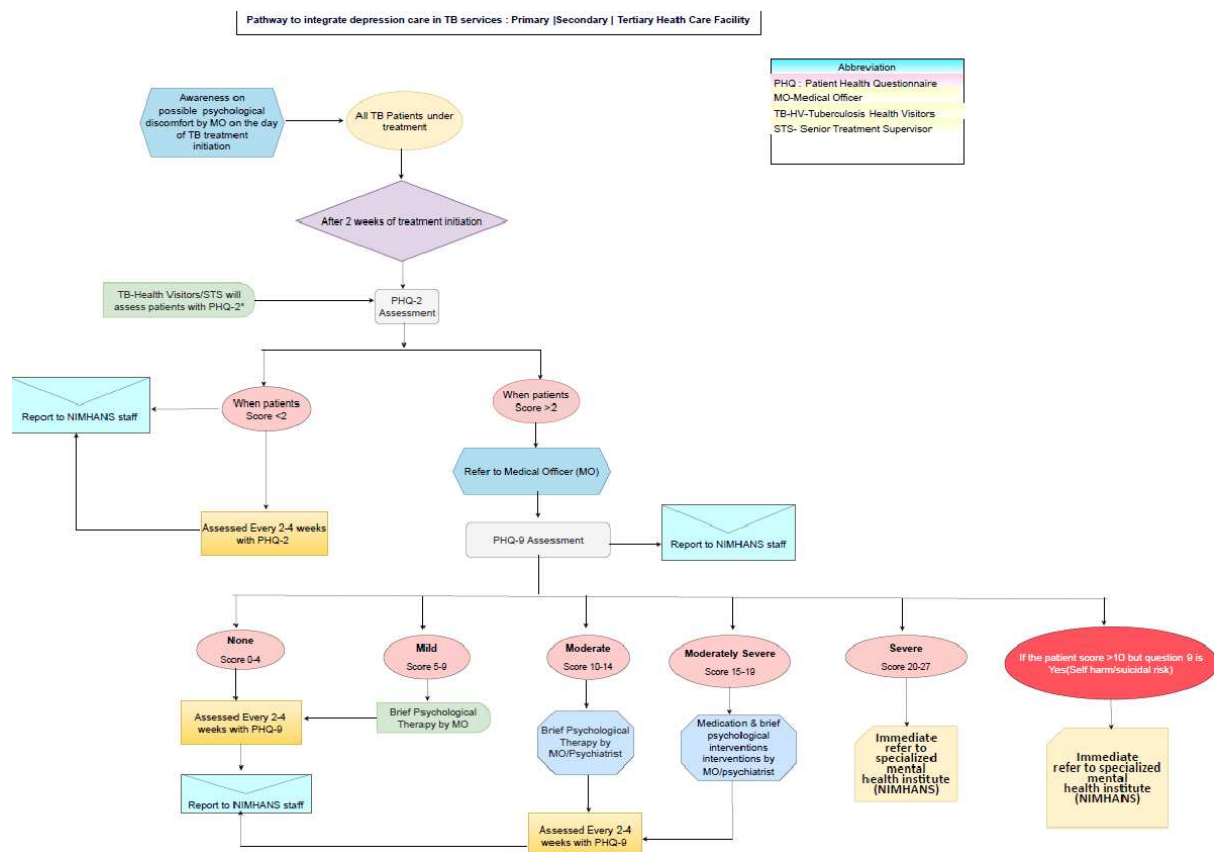
3.1.Co-design of the depression care pathway

A total of 16 participants were engaged in 9 workshops, including 12 health professionals [pulmonologist, General Physicians and Pathologists, Medical Officers (MOs), Senior TB Laboratory Supervisor (STLS), TB Health Visitors (TBHV), Senior Treatment Supervisor (STS)], two patients recovered from TB and two caregivers for the development of the depression care pathway. The Co-design workshops were conducted between June 2021 and August 2021.

The co-designed depression care pathway was adapted to the TB healthcare services setting by training medical officers (n=6), physicians (n=2), pathologists (n=1), and TBHVs (n=3) in all three centres through an online platform (considering the COVID-19 pandemic). The training manual included information on signs and symptoms of depression, causes of depression in TB patients, suicidality, counselling skills and brief psychological interventions, screening of depression with the PHQ-2 & PHQ-9, and referral pathways to MHPs for further

care and evaluation. In addition, the training manual also included information on suicidality and counselling skills.

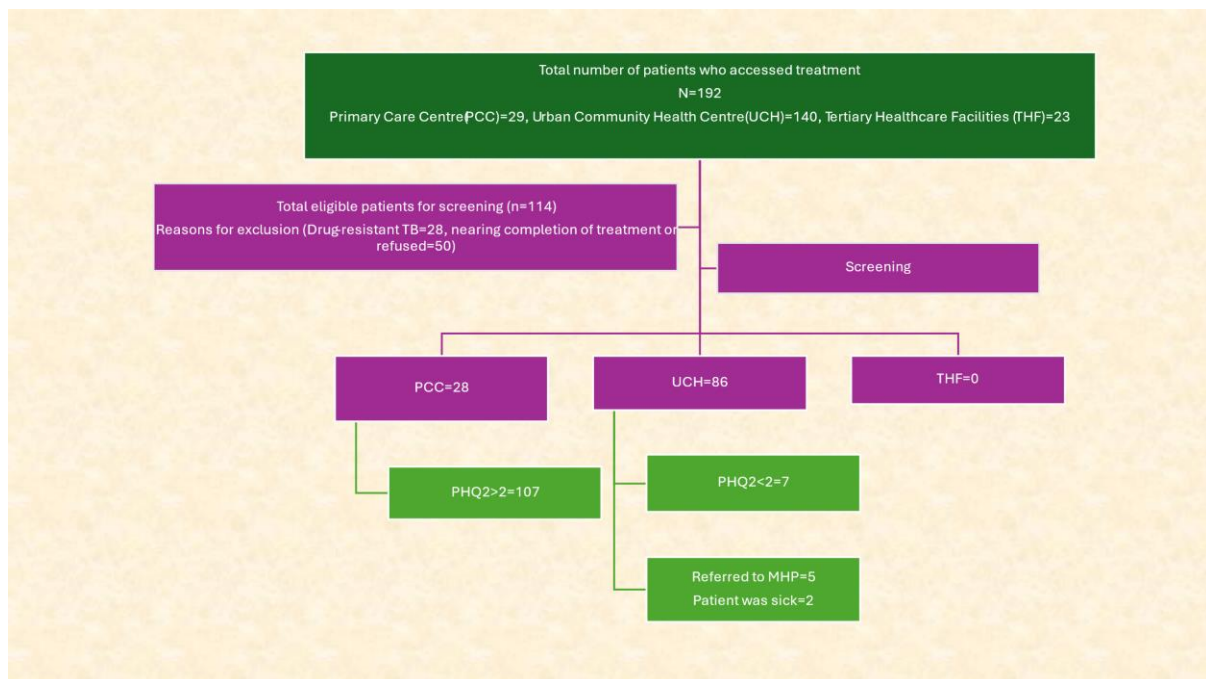
As the first point of contact, trained health professionals conducted an initial screening using the Patient Health Questionnaire-2 (PHQ-2) (Kroenke et al., 2003). Patients with a score of 2 or less were included in the usual care pathway, while those with a score above 2 underwent further screening based on the PHQ-9 (Kroenke et al., 2003) to assess the severity of their depression. Post-assessment via the PHQ-9, any patients with a score less than four were followed up with the usual care by the centre, and mild (scores of 5- 9) and moderate (scores of 10- 14) patients were provided brief psychological therapy by trained health professionals at the centre. The centre referred patients with moderate-to-severe depression (10-14) and severe depression (15-19), and those who required immediate attention, to mental health facilities.



3.2. Feasibility testing of the developed care pathway

Between 7th December 2021 and 6th March 2022, a total of 192 people with confirmed TB visited the three centres. 29 at the Primary Care Centre, 140 at the urban Community Health Centre and 23 at tertiary healthcare facilities (in Bengaluru, Karnataka, India). Among the 192 people, 28 had drug-resistant TB, and 50 of them either were nearing the completion of their TB treatment or refused to take part in the screening. A total of 114/164 (69.51%) patients were screened for depression using the PHQ-2. Most of the screenings [86 (75.4%)] carried out in urban community health centres (secondary health care centres), and the tertiary healthcare facility didn't conduct any screenings, because the centre usually provides treatment for treatment-resistant TBs. Nearly two-thirds [73 (64%)] of the participants had pulmonary TB, and the remaining participants [41 (36%)] had extrapulmonary TB.

Flowchart 2: Screening



3.3. Sociodemographic profile of people with TB

The mean age of the participants was 37.73 years (SD = 13.49). One of the female participants screened was pregnant. Most of the participants screened were male [64 (56.1%)], were married [82 (71.9%)], and 57 (49.9%) were not formally educated or educated below higher

secondary education. Twelve (10.6%) of the identified cases were either unemployed or unable to work due to illness, and most (55, 48.2%) were self-employed. Nine (7.9%) of them had comorbid alcohol use disorders, and 21 (18.4%) had tobacco dependence. In terms of comorbid diagnosis, 22 (19.3%) had diabetes mellitus, three (2.6%) had hypertension, and one (0.9%) had tested positive for human immunodeficiency virus (HIV).

The sociodemographic details are given in Table 1.

3.4. Depression rates among people with TB

A total of 114 participants were screened for depression via the PHQ-2, 107 (93.9%) were reported to have a score of less than 2, and 7 (6.1%) had a score greater than 2. Among the seven identified patients, only five were screened with the PHQ-9 and offered mental health treatment and other care by referral. Two patients out of seven identified were sick due to TB and could not participate in further treatment and care.

3.5. Barriers to and facilitators of the integration of depression care in TB care

Qualitative analysis

The feedback on the need to integrate depression care into existing TB care and the challenges reported by persons with TB and their caregivers, TB health workers (TBHVs) and health professionals (HPs) are summarised in *Tables 2 and 3*. The key findings are discussed below, grouped into two categories: (i) feedback on the components and benefits of the intervention, and (ii) challenges encountered during the delivery of the intervention.

(i) Acceptance of the intervention (Table 2)

The tools used to screen for depression (PHQ-2 and PHQ-9) were reported to be simple to respond to, as they are vernacular (validated in most of the Indian languages) and easy to understand. The contents, pathways of care and training were deemed appropriate and quick to learn; the referral pathways were clear based on the severity of the condition, and easy to understand. Healthcare professionals reported that training helped them improve their

knowledge of the signs and symptoms of depression, the mental health impact of TB on individuals and caregivers and the need to explore psychosocial issues during routine care and pathways of care. The people with TB reported more confidence in their knowledge of depression.

“Training was beneficial, and it helped in implementing this screening process and integrating the services; the screening tools (PHQ2 and PHQ-9) were easy to understand and easy to administer”. (HP)

“It was a new learning experience for me; I learned a lot from this study. I have understood how to inquire patients about the problems they are facing, when to ask direct questions, when it must be an indirect question and how to approach them and provide support”. (TBHV)

In the qualitative findings, participants reported that the care pathways helped them share their feelings with healthcare professionals, making them feel supported and cared for. Many described it as one of the first opportunities during their treatment to discuss and share broader psychosocial issues affecting their psychological well-being. Patients also expressed that being asked about mental health concerns as part of routine care would be both helpful and reassuring.

“Beneficial service and I felt comfortable venting my concerns and felt supported” (PwTB).

“We can share our concerns and what we are experiencing in detail and comfortably” (PwTB).

Table 2: Acceptance of the intervention

(ii) Challenges faced.

The themes related to challenges during the integration of depression care include logistical barriers, a lack of availability of MHPs and burdens to healthcare workers due to increased caseloads and care responsibilities.

“As there is a lot of workload. It would be more effective if a specific staff member were assigned to oversee these activities. When any patient gives adequate time, it matters a lot to gain their trust and help them with their concerns, so it will be useful if there can be new staff for this purpose”. (TBHV)

In addition, the COVID-19 pandemic outbreak during the study process limited in-person training for healthcare professionals, and the pandemic also resulted in poor follow-up rates in TB centres, which reduced the number of screenings during the study.

“We would prefer in-person training, but then, owing to COVID and related issues, it was conducted online”. (HP)

The qualitative findings also suggest that patient-related challenges such as poor drug adherence, poor care-seeking behaviour regarding mental health issues and stigma and discrimination related to TB and depression constitute barriers to care provision.

“People might be concerned about the neighbours or others knowing that they are having some mental health problems. This may make them feel more upset, and they may not consent to further treatment and care”. (HP)

Table 3: Challenges faced

4. Discussion

We have described the development and feasibility of integrating the depression care pathway within TB services in India. The co-design research method adopted in this study to design the pathway has been considered one of the most suitable methods in public health and the management of health conditions (Slattery et al., 2020). The study engaged various key

healthcare professionals, including TB health workers, medical officers, people with TB, and their caregivers, at each stage through a series of workshops. The creative approach used in this research helped us bring health professionals, patients, carers, and policymakers together as active and equal partners by valuing each one's contributions to understanding, finding solutions, and developing care pathways to manage depression among people with TB (Grindell et al., 2022; Halvorsrud et al., 2021; Vargas et al., 2022).

This study developed a comprehensive depression care pathway and integration process within existing TB healthcare services, which was performed for the first time in India and may constitute the first attempt in the region (Mainga et al., 2022; Padayatchi et al., 2019; Yohannes et al., 2020). Training was provided to non-MHPs working in TB care services, which is an effective method of task shifting that helps identify and screen for depression at an early stage and refers to people for further evaluation and screening by utilising existing care providers in TB care (Chopra et al., 2023). Similarly, studies conducted in primary health care centres emphasise the importance of training non-MHPs in the identification of mental health issues and for appropriate referrals for specialised care to reduce the treatment gap, especially in LMICs (Caulfield et al., 2019; Patel et al., 2011; van Ginneken et al., 2014).

The developed pathways of depression care were based on mhGAP (World Health Organization (WHO), 2008), a widely used model for mental health care to reduce the mental health treatment gap in resource-scarce settings, and the model provides a detailed description of care pathways to manage mental health conditions in primary health care (Chaulagain et al., 2020; Keynejad et al., 2021; Pinchuk et al., 2021). The development of a depression care manual with information on the care pathways used has not been elucidated in previous studies conducted in other LMICs (Issa et al., 2010; Molebatsi et al., 2021; Yohannes et al., 2020).

To screen for depression among people with TB, trained service providers used the PHQ-2 and PHQ-9 scales. These scales were administered by the patients reading the questions

aloud. These scales have been widely used to screen for depression among people with TB (Chopra et al., 2023; Issa et al., 2010; Yohannes et al., 2020). They are easy to administer and consume little time (Abdel-Rahman et al., 2021; Rathod et al., 2018). The feedback from the health professionals revealed that the PHQ-2 and PHQ-9 screening tools were suitable and easy to administer.

The developed depression care pathway was delivered through a combination of education, training in screening tools, guidance to follow the referral pathway, and feedback collected at the end of the research. Studies conducted to identify interventions to improve the detection of depression in primary healthcare systems have also recommended a similar approach (Fekadu et al., 2022; Habtamu et al., 2023). The feedback from TB health professionals highlights the benefits of training screening tools and providing information on mental health issues for identifying and referring people with TB for further mental healthcare and support to improve their depression (Charan et al., 2019; Subbaraman et al., 2016).

The trained TB health visitors were able to screen people with TB to identify depression within the three centres. Studies conducted in other settings with similar objectives have identified depression among people with TB by distributing screening tools or screening by the research team rather than using the services of trained healthcare workers within the existing service. The existing studies have not provided details and information on integrating depression care with existing healthcare services for TB (Issa et al., 2010; Walker et al., 2018; Yohannes et al., 2020).

Studies conducted in other countries have reported higher rates of depression among individuals with TB (Ambaw et al., 2017; Chakaya et al., 2021; Molebatsi et al., 2021) compared to the current study. Though the study screened a limited number of individuals with TB (n=114), the study identified only seven individuals positive for moderate to higher depression, which is far below the national prevalence ratio. The study and screening may have

taken place during the second wave of COVID-19 in India, when cases were highest, travel was restricted, and only urgent healthcare was prioritised (Kar et al., 2021), potentially decreasing the number of people seeking TB treatment (Malik, 2022; Ranjan et al., 2021).

In this study, stigma was reported to be one of the challenges to integrating mental health services with existing TB care. Stigma has been reported to be one of the primary reasons for poor care seeking, thus resulting in poor treatment adherence among persons with TB (Mainga et al., 2022). In addition to stigma and negative attitudes, poor care-seeking behaviour and fear and hesitation among persons and families also negatively impact the identification and provision of interventions for mental health issues (Chandra et al., 2019; Mainga et al., 2022). In the present study, the demographic details of the screened participants revealed socioeconomic deprivation and a lack of formal education; these factors resulted in poor knowledge and awareness of TB and comorbid depression and can be considered barriers to providing health care interventions.

Addressing comorbid alcohol and tobacco use is essential, as is providing depression care to persons with TB (Silva et al., 2018; Wigger et al., 2022). The comorbidity of alcohol and tobacco use in the present study ranged from 7.9%-18.4%, and the qualitative findings from the healthcare providers reported their challenges in addressing alcohol and tobacco use. Global epidemiological and public health studies have reported the impact of alcohol and tobacco use as mediators of poor health and treatment outcomes, leading to premature deaths in TB patients (Jinyi et al., 2024; Thomas et al., 2019).

4.1.Strengths and limitations of the study

This study provides detailed descriptions of the development and integration of screening and depression care in three different healthcare settings within existing TB services. This is among the first feasibility studies in India to co-design and test a depression care pathway within TB services. The study employed a co-design method that involved active participation,

involvement, and engagement from each key stakeholder. The study developed a depression care pathway and integrated it within three diverse TB healthcare centres. The selection of three different healthcare facilities helped demonstrate the model's integration in various settings. The study provided a set of preliminary feasibility outcomes that will be useful for scaling up the model to check its real-world effectiveness.

The COVID-19 pandemic significantly impacted the planned research process, face-to-face training of TB healthcare workers, screening, and provision of basic mental health and referral services. The pandemic potentially resulted in fewer patients seeking healthcare services during the study period.

5. Conclusion

TB is a communicable disease that contributes significantly to the healthcare burden. Eradicating TB is one of the primary health goals in India. Comorbid depression has many implications for treatment outcomes and quality of life among persons with TB. The current care pathway model has been developed and tested for feasibility within India's existing TB care services. Health professionals and patients found the model acceptable. To establish its effectiveness, sustainability, and long-term outcomes, the model requires testing through implementation research methods. We have used a task-sharing and task-shifting approach in the study that warranted sustainability of the pathways; however, future research should focus on mechanisms for continuous training, supervision and support for TB health workers that ensures the integration of depression care among this population and also including interventions for substance use and stigma. Peer counsellors could be a way forward to ease the burden on the TB health care personnel. The NTEP could adopt the model if it is effective for training, identifying and delivering appropriate care for depression among persons with TB in India.

Ethics approval

The study was approved by the Institute Ethics Committee of the National Institute of Mental Health and Neurosciences (NIMHANS), Bangalore, India (NIMHANS/28th IEC (BEH.SC.DIV.)/2020-21) and by the University of York Health Sciences Research Governance Committee (HSRGC/2020/418/D). Permission was also obtained from the Health Ministry Screening Committee, Government of India (HMSC 2021--0116) and the Department of Health, Government of Karnataka.

Data availability statement

The data are not uploaded to a public repository because of the sensitivity of the information. The data, however, are available upon request to the corresponding author, provided that any personally identifiable information is removed and the secondary disclosure risk is minimised.

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Table 1: Sociodemographic details of the patients who were screened during phase 3 of the study			
Characteristic	Category	Frequency (n=114)	Percentage
Gender	Male	64	56.1
	Female	50	43.9
Marital Status	Never married	27	23.7
	Currently married	82	71.9
	Divorced	1	0.9
	Widowed	4	3.5
Level of education	No formal schooling	33	28.9
	Less than primary school	4	3.5
	Primary school completed	20	17.5
	Secondary school completed	16	14.0
	High school completed	21	18.4
	Undergraduate degree completed	18	15.8
	Postgraduate degree completed	2	1.8
Employment status	Nongovernment employee	9	7.9
	Self-employed	55	48.2
	Student	5	4.4
	Homemaker	33	28.9
	Unemployed	10	8.8
	Unemployed (unable to work)	2	1.8

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Table 2: Acceptance of the intervention			
Coding and thematic analysis of feedback into themes, categories and domains, as referred by persons with TB (*), TB Health Visitors (TBHV) (●) and health professionals (#)			
Theme	Sub-theme	Brief Description	Reported
Feasibility and usability	Ease of administration	Screening tools were easy to use in the routine TB settings and appropriate.	# ●
	Training	The training received was clear and helpful for depression screening.	#
Enhanced mental health literacy	Knowledge of depression and psychosocial issues	Gained knowledge about depression	# ● *
	Understanding of mental health services	Treatment and services	#
	Resource identification	Resources available for care	# *
Strengthening of care pathways	Screening and Identification	In the care pathway, the depression care was strengthened in terms of screening and identification.	#
	Referral mechanisms	A clear referral pathway has been provided, which includes referrals to Mos and mental health services. Referral to the MH professionals	● #
	Follow up	Regular follow-up at the centre	#
		Telephonic follow-up	●
		Treatment adherence	# ●
Psychosocial and emotional support	Emotional expression	The pathway provided an opportunity for participants to express emotions	*
	Feeling supported	Participants felt they were supported emotionally.	*

	Usefulness of referral service	Participants believed that receiving appropriate mental health referrals is beneficial.	*
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Table 3: Challenges faced

Coding and thematic analysis of feedback into themes, categories and domains, as referred by persons with TB (*), TB Health Visitors (TBHV)(●) and health professionals (#)

Theme	Sub-theme	Brief Description	Reported
System-level constraints	Limited access to specialists	Nonavailability of specialised MHP in the routine TB services	# ●
	Capacity constraints	Inability to handle multiple cases, considering the caseload in each centre	#●
	Staff shortages	Shortage of health professionals and poor patient-to-health professional ratio.	#●
Illness-related complexity	Co-morbid conditions	Multimorbidity among patients includes complex issues such as substance use and suicidality	#●
Impact of COVID-19	Training limitations	The training was originally designed to be face-to-face; however, due to the pandemic, online training was provided, which limited the learning experience.	# ●
	Disruption of Follow-up	The movement restrictions impacted TBHV's ability to conduct an in-person follow-up.	#●
Service user level challenges	Poor adherence and drop-out from treatment	Poor adherence and dropout were reported in most cases, which limits a continuous, comprehensive service.	# ●
	Indirect/Proxy follow-up	The relatives and family members responded in place of the patient during the follow-up	●
	Contact barriers	Wrong/updated telephone numbers provided	●

	Care-seeking behaviour	Poor care-seeking behaviour from the patients due to multiple determinants	# ● *
Psychosocial barriers	Stigma	Stigma related to TB and MI in the community, and fear and hesitation to seek care due to that.	# ● *

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