

Community willingness towards a hypothetical new TB vaccine: a qualitative study to explore the enablers and barriers for vaccine acceptability in Nepal

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ABSTRACT

Introduction Tuberculosis (TB) remains a leading cause of death in low- and middle-income countries, including Nepal. Although new TB vaccines are in clinical development, little is known about public willingness to accept them. This study explores the enablers and barriers for public acceptance of a hypothetical new TB vaccine among communities in three TB-affected districts in Nepal.

Methods We conducted an exploratory qualitative study in three TB-affected districts of Nepal—Morang, Banke and Mahottari. Six focus group discussions were conducted with 60 purposively selected participants with separate sessions for male and female participants from diverse sociodemographic backgrounds. Data were collected using a semi-structured guide adapted from the Capability, Opportunity and Motivation-Behaviour (COM-B) model, audio-recorded, transcribed, translated and analysed using semi-ductive reflexive thematic analysis aligned with the COM-B framework.

Results This study showed that the participants viewed a new TB vaccine positively, shaped by their experiences with COVID-19 vaccination and trust in government-led vaccination programmes. Key enablers included recognition of vaccines as preventive tools, positive vaccination experiences, mobilisation of healthcare workers and community figures in vaccine implementation and use of innovative communication strategies such as caller-back ringtone playing transparent vaccination message. Barriers included limited knowledge about TB vaccines, concerns about safety and efficacy, and exposure to misinformation. These factors interacted with other constraints to access vaccines, including lost wages and transportation costs, operational challenges at vaccination sites and geographic distance. Gender-specific challenges were identified, including limited mobility among caregivers and postpartum mothers and disproportionate TB-related stigma experienced by women.

Conclusion This study provides early community-level evidence indicating a favourable attitude towards a future TB vaccine. While the vaccine acceptance was shaped by institutional trust and prior vaccination experiences, inter-related barriers identified were knowledge gaps,

safety concerns, indirect income loss and service-delivery constraints. Early equity-oriented planning can support the effective rollout of a new TB vaccine rollout.

WHAT IS ALREADY KNOWN ON THIS TOPIC

- ⇒ Nepal lies in the top 30 high-burden nations for drug-resistant tuberculosis (DR-TB) and DR-TB ranks among the top 10 causes of death.
- ⇒ The high burden of DR-TB underscores the need for TB vaccine. The currently available BCG vaccine provides limited protection against pulmonary TB in adolescents and adults. Currently, there are 17 TB vaccine candidates are in clinical development.
- ⇒ Literature suggests the importance of conducting formative research to determine the most appropriate strategies before introducing any new vaccine.

WHAT THIS STUDY ADDS

- ⇒ This study provides evidence on community perceptions of a hypothetical new TB vaccine. It highlights that vaccine-related decision-making is complex and can be influenced by a cumulative effect of vaccine-related beliefs, knowledge and experience, accessibility and costs, public trust in healthcare systems, vaccine delivery efficiency and social values in shaping vaccine behaviour.
- ⇒ Using the Capability, Opportunity and Motivation-Behaviour (COM-B) model, the study provides a behaviourally informed understanding to guide effective vaccine rollout strategies.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

- ⇒ The findings of this study can inform national strategies for TB vaccine rollout by addressing both behavioural and structural determinants of vaccine uptake.
- ⇒ They also provide a foundation for future research on behavioural interventions, particularly in low- and middle-income countries like Nepal, to better understand vaccine acceptance and support successful vaccine introduction.

INTRODUCTION

Tuberculosis (TB) is a chronic infectious disease caused by *Mycobacterium tuberculosis* (Mtb), transmitted through airborne droplets when individuals with TB cough, sneeze or spit.¹ In 2023, TB became the leading cause of death from a single infectious agent, after being surpassed by COVID-19 for three years.² However, the global number of TB incidence declined in 2024 for the first time since 2020, following three consecutive years of increases (2021–2023) attributed to COVID-19-related disruptions in TB diagnosis and treatment.¹ Moreover, it remains the primary cause of death among people living with HIV, responsible for over one-third of all AIDS-related deaths.³

Although TB is both preventable and treatable, 10.7 million people developed TB and 1.23 million people died from TB worldwide in 2024.¹ Low- and middle-income countries (LMICs) constitute 80% of the global TB burden, with 90% of people aged 15–64 years getting affected.^{1 4–7} Approximately one-quarter of the global population is estimated to be infected with Mtb, with 5%–10% at risk of developing active TB during their lifetime.⁴ Key risk factors for TB include undernutrition, smoking and alcohol use disorders, diabetes and HIV infection.¹

Nepal is an LMIC in South Asia with TB as one of the leading causes of death among both men and women, and placing the country among the world's top 30 high-burden nations for drug-resistant TB (DR-TB).^{1 8} Although the National TB prevalence survey estimates about 69 000 TB cases, only 35 000–40 000 are enrolled, notified and treated annually by the National TB Programme, highlighting significant underdiagnosis and under-reporting within the health system.⁹ A multitude of barriers to accessing TB care in Nepal have been identified, including limited knowledge of TB, challenging geographical terrain, distant health facilities, inadequate social protection policies and the stigma, anxiety and depression related to TB.^{10 11} The National Strategic Plan (2021/2022 to 2025/2026) aims to overcome these barriers and recognises the need for comprehensive intervention strategies to address these multifaceted challenges.¹²

The persistence of TB as a leading cause of death in LMICs reflects the compounding challenges of poverty, weak healthcare systems and financial constraints.⁵ These challenges highlight that progress towards achieving the World Health Organisation's (WHO) End TB strategy of 90% reduction in TB incidence and deaths between 2015 and 2030 is insufficient.¹ Beyond its direct physical health impact, TB inflicts substantial economic, psychological and social consequences, adversely affecting an individual's quality of life.^{13 14} Additionally, DR-TB remains a major component of the global antimicrobial resistance crisis, with an estimated 390 000 incident cases of rifampicin-resistant TB in 2024 and persistent gaps in treatment coverage.¹ Currently, the only registered TB vaccine is Bacille Calmette Guérin (BCG), which provides protection against TB in young children

but offers minimal protection against pulmonary TB in adolescents and adults.^{4 6} All these issues underscore the need for effective tools such as TB vaccines to combat this persistent global health challenge.^{1 6 8 15}

According to the Tuberculosis Vaccines Pipeline Report 2024, there are 17 TB vaccine candidates, with six in phase III, six in phase II and five in phase I trials.¹⁶ These phase III trials are expected to enrol thousands of participants in TB-burden settings, with both new and existing vaccines. Health impact modelling studies suggest that vaccinating adolescents and adults could substantially reduce TB incidence.¹⁷ However, growing scepticism about vaccine safety and efficacy is fueling vaccine hesitancy, presenting challenges to global vaccination efforts.^{18 19} The WHO global framework stresses the need for early planning and addressing the opportunities and challenges of vaccine delivery to ensure equitable access and acceptance by healthcare workers, policy-makers and end-users.⁷ Literature on the human papillomavirus (HPV) vaccine underscores the importance of conducting formative research to determine the most appropriate strategies before introducing any new vaccine.²⁰

This study explored the enablers and barriers to public acceptance of a hypothetical new TB vaccine among the residents of three TB-affected districts in Nepal to provide critical insights for policymakers in developing strategies for the successful implementation of a future TB vaccine.

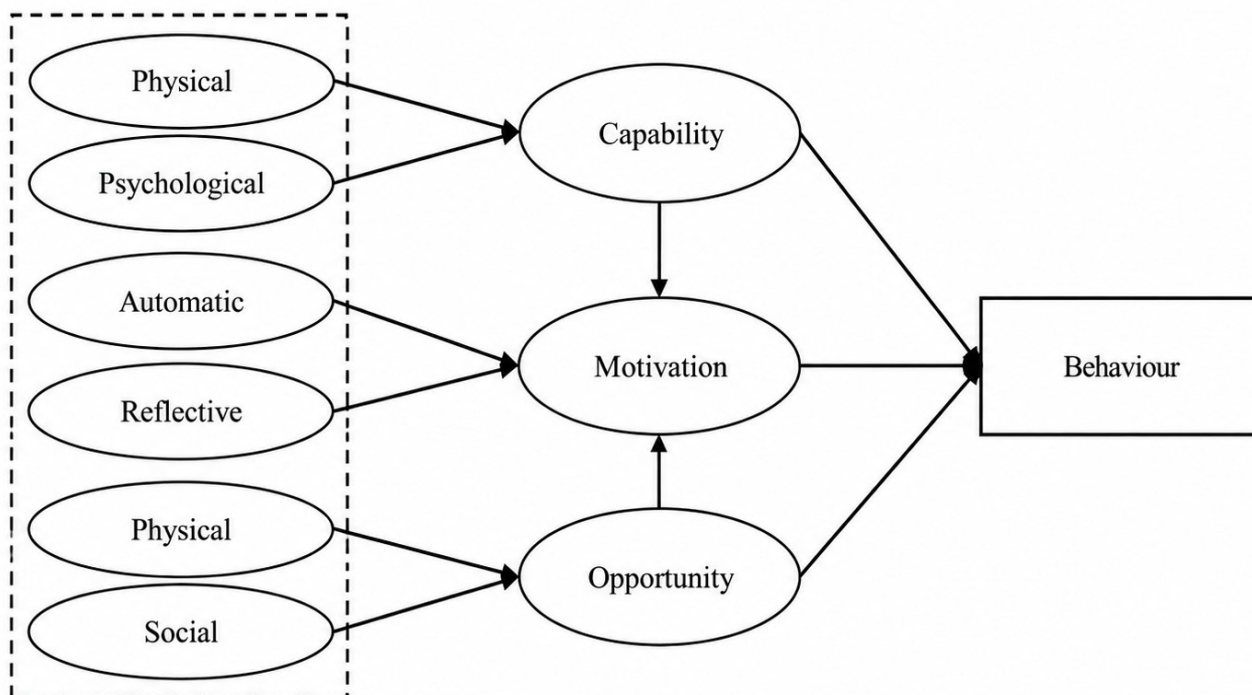
METHODOLOGY

Study design

We conducted an exploratory qualitative study to explore the enablers and barriers for public acceptance of a hypothetical new TB vaccine in Nepal using Capability, Opportunity and Motivation-Behaviour (COM-B) model.²¹ This model explains individual behaviour as a result of interactions between capability (C), opportunity (O) and motivation (M) and recognises the influence of individuals, groups and environments on behaviour.²²

Capability refers to an individual's psychological (cognitive processes, comprehension and reasoning) and physical (skills and knowledge) capacity to engage in the concerned behaviour. Opportunity encompasses external physical and social factors that influence how an individual thinks and makes behaviours possible. Motivation involves the brain processes that drive behaviour, including conscious goals, decision-making and emotional influences.²¹

The model is well-suited for this research as it offers a comprehensive framework to deepen understanding of TB vaccine acceptance by examining individual, systemic and environmental influences. Using this model in the study, we can understand the complex problem of vaccine acceptance and inform effective interventions for people's behaviour change (figure 1).²² This study report adhered to the Consolidated Criteria for Reporting



Note. Adapted from: “The behaviour change wheel: A new method for characterising and designing behaviour change interventions,” by S. Michie et al., 2011, *Implementation Science*, 6(1), p.42.

Figure 1 The Capability, Opportunity and Motivation-Behaviour model.²¹ Adapted from Michie et al.²²

Qualitative Research (COREQ) Checklist²³ (online supplemental appendix A: COREQ checklist).

Study setting

Geographically, around 60% of the 30 districts with high TB case notifications are located in the Terai region. The National Tuberculosis Profile 2025 reported a total of 40 776 notified TB cases in Nepal, with the highest provincial case notifications recorded in Madhesh (10 143 cases), followed by Bagmati (9408 cases) and Lumbini (8444 cases).^{8 24} Accordingly, this study was conducted in three TB-affected districts located in the Terai region: Mahottari (Madhesh province), Banke (Lumbini province) and

Morang (Koshi province) to capture community perspectives from high-burden settings. A detailed description of the study districts is provided in table 1.²⁵

Participant recruitment

Two study team members (KD and BD), each with over 5 years of experience in TB research, conducted a stakeholder mapping exercise through consultations with TB researchers and a desk-based scoping review. This process was used to identify relevant population groups whose perspectives were considered critical for understanding community acceptance of a future TB vaccine. The population groups identified through stakeholder mapping,

Table 1 Characteristics of the three study districts

Characteristics	National	Mahottari	Banke	Morang
Population	29 164 578	706 994	603 194	1 148 156
Population density (person per square kilometre)	198	706	258	619
Population growth rate (%)	0.92	1.14	1.97	1.66
Literacy rate (%)	76	60	73	79
Total notified TB cases (all forms of TB) ⁸	40 766	1136	1070	1319
TB, tuberculosis.				

Table 2 Identified population group during stakeholder mapping alongside its rationale

No.	Identified population group during stakeholder mapping	Rationale
1	Daily wage workers	Higher risk of TB exposure and greater vulnerability and less likely to seek health care ⁹
2	Community role-models (teachers, community leaders, social workers, religious leaders)	Trusted and influential figures who can shape community attitudes and support dissemination of vaccine-related information
3	Fathers within households	Primary decision-makers for health-related matters, including vaccination, in many households. More cases of TB in men are also seen compared with women ¹
4	Mothers within households	Key caregivers and secondary decision-makers, often responsible for accessing vaccination and other health services
5	Students or young people	Represent perspectives of younger age groups and future vaccine recipients
6	Community health volunteers	Frontline providers of health information and key intermediaries between communities and the health system
7	TB-affected individuals and their family members	Provide experiential insights into TB prevention, treatment and perceptions of vaccine acceptability
8	Ethnic minority population	Groups that may face social marginalisation and barriers to healthcare access requiring inclusive representation

TB, tuberculosis.

along with the rationale for their inclusion, are presented in [table 2](#).

The identified population groups were shared with the field teams in the three study districts, who reviewed them for local contextual appropriateness prior to participant recruitment. The district field team consisted of locally based TB programme staff and research associates with over 10 years of experience in community engagement and field-based research. They were responsible for purposive recruitment of the participants to ensure representation across diverse socioeconomic backgrounds.

Participant recruitment employed multiple strategies, including face-to-face contact in local communities for

daily-wage workers, telephone outreach for individuals affected by TB and their family members, and coordination with district health offices to recruit other study participants. All participants were adults aged 18–70 years residing in the three selected districts. No approached individuals refused participation.

Data collection

Focus group discussions (FGDs) were conducted to explore the shared community perceptions of enablers and barriers to acceptance of a hypothetical new TB vaccine. Between April and May 2024, six FGDs across three districts were conducted, with separate sessions for male and female participants to account for local gender dynamics in health decision-making.

Given the exploratory and formative nature of the study, data collection was guided by the principle of information power, with the aim of capturing diverse perspectives across different geographic and sociodemographic contexts rather than achieving thematic exhaustiveness within a single site or population group.^{26 27}

Although data saturation was not used as an a priori stopping criterion, existing methodological literature indicates that thematic saturation in focus group studies is commonly achieved within four to eight group discussions, particularly when research objectives are clearly defined.^{28 29} Conducting six FGDs was therefore considered appropriate to explore shared community experiences of TB vaccine acceptance across the selected districts. The FGD guide (online supplemental appendix B: FGD guide) was developed by the multidisciplinary study team, which included TB researchers, social scientists and public health professionals. AD (female, social scientist, doctoral student) led the development of the FGD guide, with contributions from KD (female, TB researcher, PhD) and BD (female, public engagement officer). The guide was structured using the COM-B model to identify the factors influencing behaviour in the acceptance of a new TB vaccine in the Nepali population.

Training

The district programme coordinator and research associate (RA) served as facilitators in all three districts, all of whom had over 10 years of working experience in TB programme management. Before data collection, KD and BD trained them on FGD guide, consent, ethics and other research components like the participant information sheet. Facilitators practised FGD guide before conducting the actual FGDs to ensure a thorough understanding.

Procedure and materials

The FGDs were conducted in local hotels in all three districts, chosen for their accessibility to the participants. The FGDs were audio-recorded and transcribed verbatim by independent researchers with public health expertise. The FGDs lasted for around 2 hours on average. In Mahottari, a female bilingual speaker transcribed the

Table 3 Sociodemographic information of the participants stratified by district (n=60)

	Morang (20)	Banke (20)	Mahottari (20)	
Sociodemographic characteristics	n	n	n	Total (60)
Age of the participants				
19–28	5	2	3	10
29–38	9	9	6	24
39–48	2	4	5	11
49–58	3	3	2	8
59–68	1	2	4	7
Highest educational degree attained				
Illiterate	1	3	2	6
Literate	5	4	2	11
Primary level (grade 1–8)	4	5	3	12
Secondary level (grade 9–12)	9	3	7	19
Undergraduate and higher	1	5	6	12
Employment status of the participants*				
Unemployed	8	8	10	26
Salaried employment	2	4	5	11
Informal jobs	9	7	4	20
FCHV	1	1	1	3
Vaccinated with any vaccine in the last 1 year				
Yes	20	18	19	57
No	0	2	1	3
Informal jobs: business owners, street vendors, daily wage workers and labour-intensive workers.				
*Unemployed: social workers, home-makers, retired individuals, students, agricultural worker. Salaried employment: government employees, teachers, journalists.				
FCHV, female community health volunteer.				

participants' conversations that were done in the local language and translated into Nepali. All the transcriptions were then translated into English by an external translator and were reviewed by AD before data analysis. AD cross-checked the transcribed document with the audio recordings and verified the translated document to ensure the language nuances were retained in the English document. AD was born and brought up in the Terai region and knew the local language which made it easy to validate the audio-transcript with the translated document. All data were securely stored on password-protected computers, with restricted access to the study team. Repeat interviews were not conducted and no participants were approached again after the discussions.

Participants

Each FGD across the three districts included 10 participants, resulting in a total of 60 participants from six FGDs. An equal number of males and females participated, with ages ranging from 19 to 68 years. The detailed sociodemographic characteristics of the participants are presented in [table 3](#). Sociodemographic characteristics of participants were summarised using frequency statistics, stratified by district.

Patient and public involvement

Patients and the public were involved in this study as research participants through FGDs. However, they were not involved in the design of the study, development of research questions or conduction of our research.

Data analysis

A semi-deductive reflexive thematic analysis was conducted to identify enablers and barriers influencing community willingness to accept a hypothetical new TB vaccine. The analysis was adapted from Braun and Clarke's six-step reflexive thematic analysis framework, allowing flexibility to integrate both inductive coding and the COM-B model as an organising analytic structure.^{30 31} Two researchers (MD and AD), both experienced in qualitative research, led the analysis. After getting familiar with the transcripts, AD and MD coded each transcript independently in NVivo V.12. After coding each transcript, AD and MD discussed discrepancies, compared interpretations and refined the evolving codebook.

Following initial inductive coding, the team used the COM-B model as an analytic framework to organise

Table 4 An example of coding from the female community health volunteers

Verbatim	Codes	Subthemes	COM-B theme	Main theme
Vaccines are kind of medicine to improve immunity of an individual to fight against any disease so we don't get the particular disease in future. (Mahottari, male)	Understanding that vaccine prevents disease	Recognising vaccine as a tool for disease prevention and protection	Psychological Capability	Enabler of vaccine acceptance
Some people waited for one week to get the COVID-19 vaccine but didn't get it and had to return. (Banke, female)	Stand in queue for long hours	Operational feasibility at vaccination sites	Physical Opportunity	Barrier for vaccine acceptance

COM-B, Capability, Opportunity and Motivation-Behaviour.

and interpret the data. Codes were mapped to the COM-B components and then grouped into broader 'parent' categories based on conceptual similarity. These were refined into sub-themes aligned with the COM-B model (psychological capability, social and physical opportunity, and reflective and automatic motivation), and examined to capture both facilitators and barriers to vaccine acceptance. AD then reviewed and consolidated the subthemes, and the analytical structure was discussed with KD to ensure interpretive coherence and alignment with the study aims. The final themes and subthemes were agreed by the wider study team and are reported in the results.

An example of the coding framework and its organisation into themes and subthemes is presented in table 4. The final COM-B structured codebook is provided in online supplemental appendix D.

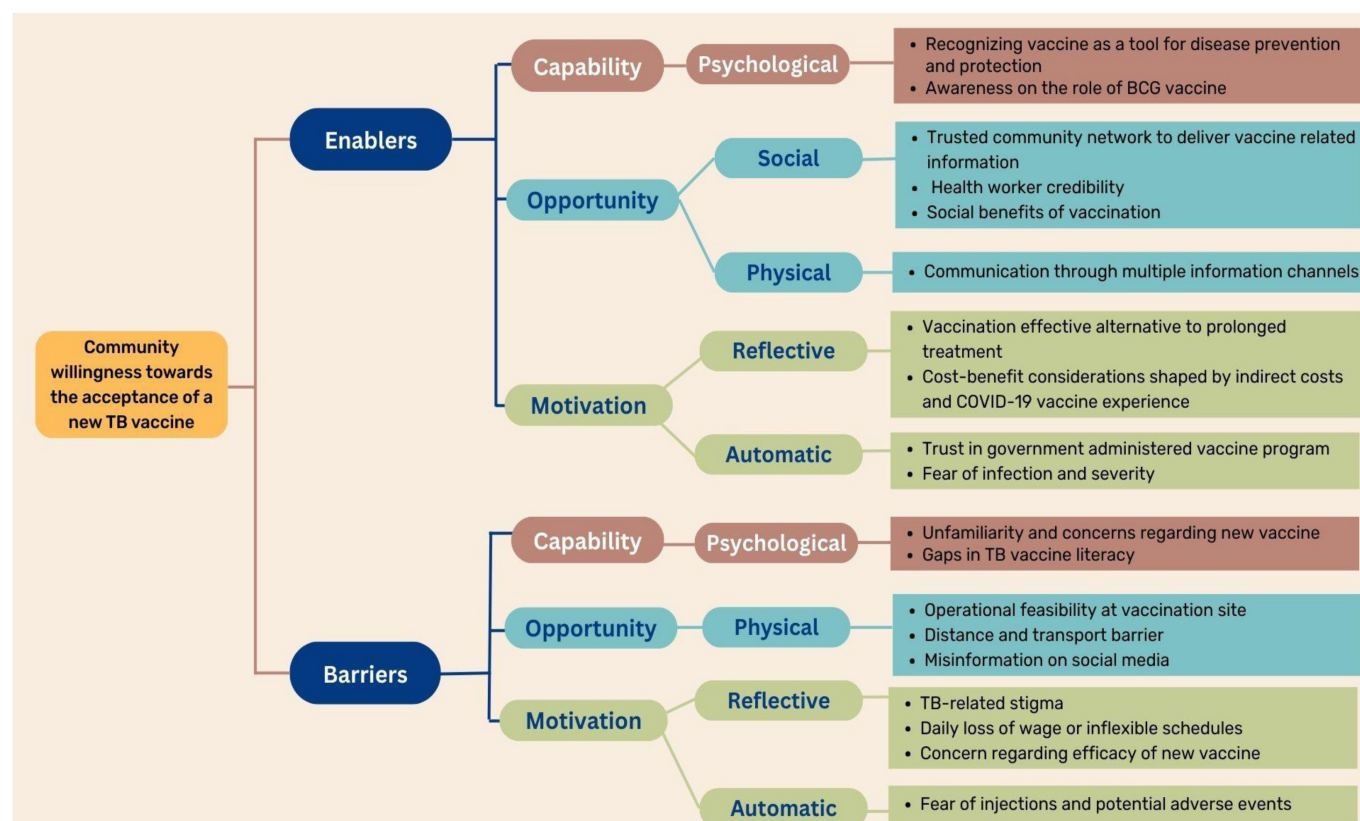
RESULTS

The COM-B model provided the thematic structure to identify the enablers and barriers for public acceptance of a hypothetical new TB vaccine among the community of three TB-affected districts in Nepal. The subthemes presented in the following sections capture both positive and negative factors that influenced the willingness to accept the new vaccine. A summary of the major enablers and barriers of a new TB vaccine acceptance reported by the participants is presented in figure 2.

Psychological capability

Subtheme 1.1: recognising vaccine as a tool for disease prevention and protection

Across all three districts, the respondents demonstrated an understanding of vaccination as a preventive health measure that protects individuals and communities.

**Figure 2** Summary of enablers and barriers for a hypothetical new tuberculosis vaccine acceptance.

Vaccines were described as preferable to treatment, and participants framed vaccination as a means of reducing illness and avoiding the burden of ongoing medication. For some, the COVID-19 pandemic further reinforced their perception of vaccination as a protective measure.

Vaccines are generally better than medicine because vaccines need to be administered every few months, whereas medication needs to be taken daily. That's why vaccines are considered better. (Banke, male, daily wage worker)

At the same time, this general confidence in vaccination did not always translate into clarity about a new TB vaccine, particularly when participants considered potential risks and the unfamiliarity of a vaccine still described as being under development.

Subtheme 1.2: awareness of the role of BCG vaccine

Participants acknowledged BCG vaccines for TB prevention and expressed strong confidence in a new TB vaccine. Notably, the TB-affected respondents and their family members emphasised prevention over treatments and highlighted its long-term benefits. Their experiences fostered a proactive mindset favouring vaccination to reduce future health risks, expressing readiness to adopt the new TB vaccine.

It [vaccine] is very useful because it is better to get prevented rather than taking medicine after getting the disease. (Mahottari, male, auto-driver)

However, discussions also revealed misconceptions and gaps in TB vaccine literacy. Some participants assumed that BCG provides complete protection against all forms of TB and questioned the need for any new TB vaccine. When presented with information that challenged these assumptions, participants expressed surprise and uncertainty.

I am surprised to learn that BCG does not work for our lungs. That is written here (information sheet). (Morang, male, street vendor)

In addition, because the hypothetical TB vaccine was described as a 'new' vaccine still in development, some participants raised concerns regarding its safety, potential side effects and suitability for vulnerable populations, and a few questioned the necessity of vaccination by contrasting it with perceived longevity among prior generations.

Social opportunity

Subtheme 2.1: trusted community networks and health worker credibility

Participants described vaccine decision-making as shaped by trusted community networks and interpersonal information exchange. Health workers at local health posts were frequently identified as key sources of vaccination guidance through public announcements and community discussions. Other community figures, like teachers, local leaders and community health volunteers, were also viewed as

influential in disseminating vaccine-related information and addressing rumours. Within households, educated family members, particularly those working in healthcare, were described as providing guidance and facilitating routine discussions about vaccination, which supported awareness and decision-making. Trust in health workers also served as a form of reassurance, with participants describing how observing health workers and other frontline personnel receive vaccines early during the COVID-19 campaign reduced fear and increased confidence in vaccination programmes.

Nothing happened to the health worker, the security worker when they took the vaccine during corona pandemic. Only then I was not scared about it that built a trust. (Mahottari, male, retired government official)

Subtheme 2.2: social benefits of vaccination

Participants identified vaccine cards as a driver for accepting new vaccines based on perceived social and economic benefits. Drawing from their experiences during the COVID-19 pandemic, this was associated with access to travel and employment and suggested that requiring certification for a future TB vaccine could positively influence their decision.

It allows them to work both domestically and abroad. Without a vaccine, one cannot travel abroad, [...]. That's why getting vaccinated is beneficial. (Mahottari, female, daily wage worker)

Additionally, participants viewed vaccination as a means of social inclusion, aligning individuals with community norms. Their acceptance of a new TB vaccine was linked to their COVID-19 vaccine experience, which was influenced by societal expectations. If mandated, TB vaccination could further drive acceptance and overcome hesitancy.

Physical opportunity

Subtheme 2.3: communication reach through multiple information channels

Participants emphasised the importance of credible and accessible vaccine-related information delivered through multiple channels. Traditional media such as radio, television and newspapers were commonly viewed as reliable sources, while digital platforms including Facebook, YouTube and Viber were increasingly influential for sharing vaccination updates. They also underlined innovative strategies like setting caller ring-back tones and mobile notifications with information on the importance of taking vaccines to improve vaccination willingness.

Subtheme 2.4: operational feasibility at vaccination sites

Participants identified operational conditions at vaccination sites shaping the feasibility of vaccination. Challenges like overcrowding, long queues and limited opening hours were described as influencing whether

people could realistically access vaccination services, especially for daily wage workers, students and individuals with disabilities. A few participants recalled prolonged waiting experiences during COVID-19 vaccination, which informed their expectations about future vaccine roll-outs.

At that time, even I stood in line for two days. On the third day, I had to push forward in the middle of others just to get vaccinated, but my family still had to wait for five days. (Banke, male, driver)

Subtheme 2.5: geographic access and mobility constraints

Distance and transport barriers were described as major determinants of feasibility, particularly to vaccine access in rural areas and stressed the need to travel long distances. Participants noted that individuals with limited mobility, such as caregivers with young children, or women recovering post partum, those with chronic illnesses and people with physical disabilities may face additional challenges in accessing vaccination services.

There are sufficient health-posts in this area but in remote areas like Jumla and Mugu, reaching a health post might require traveling for two or three days. Life comes first, but those who are less able may not be able to get vaccinated. (Banke, male, daily wage worker)

Reflective motivation

Subtheme 3.1: weighing vaccination against the burden of TB treatment and social consequences

For most of the participants, the perceived protective and preventive benefits of TB vaccines motivated their acceptance decision, particularly among TB-affected individuals and their family members. They believed vaccines were a convenient and more effective alternative to prolonged treatment, frequent medication or hospital visits. The convenience of a single TB vaccine outweighed the challenges of daily medication, which they associated with inconvenience, forgetfulness and disruption.

For those six months when I had to take medicine, sometimes I would take it, sometimes I'd forget, [...] So why not get the vaccine? After getting it once, you're free from all that hassle. (Banke, female, TB-affected person)

Motivation was also shaped by anticipated social consequences of TB. The respondents highlighted the physical and emotional distress caused by social exclusion and lack of empathy toward TB-affected people which strengthened their willingness to accept future vaccines, not only to avoid illness but also to reduce stigma-related harms. TB-related stigma was reported to be higher among females, which may hinder their social and family life.

When someone gets TB, people often talk about it and say things like, 'they have TB, keep your distance.' People start to avoid and mistreat those with TB though TB is easily curable. (Mahottari, female, teacher)

Subtheme 3.2: cost-benefit considerations shaped by indirect costs and opportunity costs

Participants linked willingness to vaccinate to the practical costs of accessing services. Even when vaccines were assumed to be free, they described indirect costs, like transportation expenses and loss of wages, as shaping whether vaccination felt feasible. This was particularly salient for daily wage workers and those with inflexible work schedules, who described needing to choose between earning a livelihood and accessing vaccination services.

Vitamin A is administered from 10 AM to 4 PM, which overlaps with office hours. If I miss a day at the office, I lose my daily wages, and my boss takes action against me. (Morang, male, government employee)

To address these issues, participants suggested organising vaccination services in more accessible and spacious locations, such as open grounds or village centres, and scheduling them on holidays to accommodate a larger number of people.

Subtheme 3.3: concern about efficacy of a new vaccine

Participants often weighed perceived benefits against concerns about safety, side effects and effectiveness, particularly in relation to a 'new' vaccine. Some described a preference to wait and observe others before deciding, reflecting uncertainty about unknown or long-term risks. Experiences from the COVID-19 pandemic were frequently referenced in these deliberations, including circulating concerns that vaccination might cause severe side effects or even death.

There was a lot of talk during the COVID-19 pandemic about whether to get vaccinated. People were saying that after getting vaccinated, there might be side-effects and some even thought it could lead to more severe illness or death. (Mahottari, female, student)

Concerns about efficacy also shaped decision-making. Participants expressed apprehension about rapid vaccine introduction and raised doubts about whether vaccines guarantee protection, citing COVID-19 experiences as a basis for uncertainty. Some framed acceptability in terms of evidence and regulatory approval, indicating that trust was contingent on perceived testing and validation processes.

If the vaccine is tested and approved, then it's fine. If it suddenly becomes available tomorrow without proper testing, then it might not be okay. (Banke, male, student)

Few participants exhibited a low perception of TB risk, which reduced their motivation to seek vaccination. They questioned the need for vaccination, particularly if they had no symptoms or prior diagnosis of TB. Others compared it to diseases like elephantiasis, where preventive measures were dismissed due to a perceived low risk. Few participants downplayed the severity of TB, describing it as 'not a major epidemic'.

Automatic motivation

Subtheme 3.4: trust in government-administered vaccine programme

The FGDs indicated that vaccine acceptance stemmed from trust in the routine immunisation, which is seen as a normal part of life. This fostered a sense of automatic acceptance without questioning the effectiveness of vaccines, their purpose or their potential adverse effects. Positive experiences with past health programmes and endorsements from credible bodies like WHO further reinforced confidence without questioning vaccine effectiveness or risks.

When the COVID vaccine came, we took it, and we didn't get COVID. When the medicine for elephantiasis came, we took it, and we didn't get elephantiasis. That's why we believe that nothing will happen to us when we take this vaccine as well. (Banke, female, homemaker)

Subtheme 3.5: fear and anxiety shaped by experiences of infectious diseases

Emotional responses, particularly fear, also influenced motivation. Although TB and COVID-19 differ in infectiousness and severity, participants linked their COVID-19 experience to TB, noting that fear of infection and death could motivate acceptance of a new TB vaccine.

There was a fear of corona [COVID-19] and we thought about how to be safe. At that time, people were afraid of people. I hope that day never comes. (Banke, female, female community health volunteer)

At the same time, fear also operated in the opposite direction for some participants. Fear of injections and potential adverse events with apprehension about pain, bleeding or uncertainty, especially among those with chronic pre-existing health conditions, such as diabetes, were described as shaping hesitation. Misinformation on social media during COVID-19 heightened anxiety and hindered vaccine uptake.

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DISCUSSION

This qualitative study explored the community perceptions and willingness towards a hypothetical new TB vaccine based on the COM-B model. Overall, participants expressed broadly favourable attitudes toward a future TB vaccine, shaped by their prior experiences with routine immunisation and, more recently, COVID-19 vaccination. Vaccine decision making among the participants was a socially embedded process influenced by intersecting cognitive, structural and relational factors. Our findings underscore how behavioural determinants interact with institutional trust, health-system performance and

socioeconomic constraints in shaping vaccine acceptance in settings like Nepal.

Since the data collection for this study was conducted after the nationwide campaign for COVID-19 vaccination, participants' perceptions of a future TB vaccine were strongly informed by their lived experience of COVID-19 vaccination. This experience functioned as their reference point for assessing vaccine safety, effectiveness and government intent. Trust in government-led immunisation programmes and in frontline health workers, particularly female community health volunteers (FCHVs), emerged as a critical enabling factor. Similar patterns have been observed in Nepal and other similar settings, where confidence in public health institutions and interpersonal trust in health workers mitigated the uncertainty surrounding new vaccines.^{32 33} These findings align with broader global evidence demonstrating that trust operates not merely as an individual attitude but as a relational and institutional phenomenon shaped by historical performance, transparency and consistency of health systems.^{34 35}

Our analysis also suggests that vaccine acceptance could not solely be interpreted through individual-level behavioural constructs, but the obscuring structural forces also constrained the vaccine-related decision-making. While participants often articulated willingness to be vaccinated, this motivation was tempered by opportunity-related barriers, including indirect costs, loss of daily wages, distance to health facilities and competing livelihood priorities. These constraints echo findings from other Nepal-based and regional studies demonstrating that vaccine hesitancy may coexist with positive attitudes toward vaccination when access barriers persist.^{32 36} Consistent with the WHO SAGE Working Group's position, low uptake in such contexts should not be conflated with hesitancy alone, as system-level failures may play a more decisive role than attitudinal resistance.^{37 38}

Although the COM-B model provided a useful heuristic for organising findings, our data illustrate that capability, opportunity and motivation are deeply intertwined rather than discrete domains. Psychological capability, such as understanding TB transmission and the preventive role of vaccines, was shaped by prior exposure to public health messaging and by trusted interpersonal sources. However, knowledge alone was insufficient to drive acceptance in the absence of supportive opportunity structures. This observation resonates with behavioural science critiques that caution against over-reliance on educational interventions when opportunity constraints remain unaddressed.³⁹

Motivation, similarly, was not purely reflective or individual. Fear of TB, stigma associated with the disease, and concerns about vaccine safety were embedded in broader social narratives. Gendered dynamics further complicated motivational processes. Individuals with caregiving responsibilities, including postpartum recovering mothers, due to time constraints, household

responsibilities and competing priorities, were described as barriers by the participants. In addition, TB-related stigma was reported to be experienced by women, which may further constrain engagement with preventive services. While our analysis did not explicitly examine gendered differences in mobility or decision-making autonomy, the subtle nuances reported in the study echo the intersectional patterns observed in vaccine research across LMICs.^{32 40} These findings suggest that feminist and equity-oriented perspectives are essential to understanding vaccine acceptance, even when not explicitly foregrounded in behavioural models.

Importantly, the strong performance in childhood immunisation by Nepal presents an apparent paradox with high national coverage and persistent inequities. We believe our findings have helped to explain this tension. While collective norms supporting vaccination remain strong, the existing structural vulnerabilities, particularly among daily wage workers, ethnic minorities and TB-affected households continue to shape differential access and acceptance. Similar contradictions have been documented, where success has relied on sustained community engagement and political commitment, yet remains uneven across population subgroups.³³

This study contributes to the expanding literature on vaccine hesitancy by reinforcing its context-specific and vaccine-specific nature. In line with the WHO SAGE Working Group's 3Cs framework, participants' concerns reflected a combination of confidence (trust in vaccines and vaccine-related information when shared by trusted community networks and government agencies), convenience (accessibility of vaccines) and complacency (perceived risk), rather than outright refusal.^{37 38} Importantly, misinformation and fear of side effects were also reported but were not dominant, suggesting that proactive engagement and transparent communication may be particularly effective in the Nepalese context.^{41 42}

Comparisons with other vaccine contexts, including HPV, HIV, dengue and influenza vaccines, further highlight that acceptability of new vaccines often hinges on perceived relevance, safety and alignment with existing prevention practices.^{40 43 44} For TB that has been associated for a long time with stigma and structural deprivation, vaccine introduction strategies must therefore extend beyond demand generation to address broader social determinants and health-system readiness.^{20 33 40 45–47}

Strengths and limitations

Our study provides timely insights as the WHO accelerates TB vaccine development efforts targeting adolescents and adults in the trial phase. In the light of this, understanding community acceptance of the vaccine through FGDs allowed for exploration of shared norms and collective reasoning around vaccination. The study employed community-based perspectives from TB-affected districts of Nepal, which is crucial since public perception of the vaccines directly impacts the effectiveness of the vaccination programme.⁴¹ Additionally, the study used

a purposive, heterogeneous sample across three TB-affected districts and conducted gender-separated FGDs to balance power dynamics. Furthermore, the use of the COM-B framework facilitated a systematic yet flexible analytical approach. The study findings offer formative evidence to guide future research and inform tailored TB vaccine rollout strategies.

However, several limitations of the study should also be acknowledged. Limitations include participants' framing of responses based on their COVID-19 vaccine experiences. Since this was a hypothetical vaccine, the enablers and barriers might be affected when the actual TB vaccine becomes available. The positive attitude towards vaccination could also be influenced by the potential social desirability bias in a group setting in FGDs, as well as the positionality of facilitators as public health professionals. We tried to overcome this bias by designing FGD guides and probing positive and negative perceptions or reluctance toward vaccinations. Furthermore, additional qualitative methods like interviews and observation could have enriched the interpretive depth of the study, but the use of only FGDs could also restrict the robustness of the data. Another limitation was the use of mixed-gender facilitators in the FGDs instead of gender-matched facilitators. We did not have locally based female staff in Banke who could facilitate the FGD. Although a female facilitator was initially planned for all sites, budgetary constraints further limited our ability to recruit additional personnel or support travel for gender-matched facilitation. This may have limited responses from female respondents to report gender-sensitive information. However, to mitigate potential response bias, facilitators in all districts were trained on facilitation techniques, were encouraged to actively promote inclusive participation and followed a semi-structured guide designed to support open and respectful discussion. Finally, while COM-B supported behavioural interpretation, it does not fully capture political and economic dimensions of vaccine governance, which warrants further investigation.

Practical implications of findings for future TB vaccine implementation

Clear information and communication

Our findings demonstrated that effective community-informed communication is key for vaccine acceptance in Nepal. Trusted traditional media like radio and TV, mobilisation of local and valued community networks, along with innovative platforms such as caller tunes and digital platforms can be used to communicate vaccine-related information, expand reach to wider community populations. Such information should prioritise transparency around vaccine safety and efficacy, which has been shown to build trust rather than erode it.³⁹

Community models engagement for vaccine awareness and uptake

Leveraging healthcare workers, teachers, FCHVs and local leaders as trusted messengers can help build vaccine confidence.

Health system preparedness and management for addressing barriers

Addressing logistical challenges by decentralising vaccine services to community locations, offering flexible hours, ensuring privacy and providing financial or logistical support, particularly for unemployed or informal workers such as daily wage workers, women and people with disabilities could enhance vaccine uptake.

CONCLUSION

Nepal continues to battle TB as one of the major public health concerns despite the availability of effective anti-TB drugs. The high burden of TB in Nepal underscores the need for effective vaccines to prevent and end TB. This study provides early community-level evidence indicating a favourable attitude towards a future TB vaccine, shaped by institutional trust and positive vaccination experiences but socially and structurally driven by knowledge gaps, safety concerns, lost income and service-delivery barriers. Early and equity-oriented planning that addresses community-informed communication reducing access costs and strengthening delivery structures will be essential to support effective and inclusive TB vaccine rollout.

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Ethics approval This study involves human participants. Ethical approval was received from the Nepal Health Research Council (Ref. No. 656/2023) and the Oxford Tropical Research Ethics Committee (Ref. No. 571-23). On the day of FGD, participants were given a three-page information sheet in Nepali, outlining the study objectives, potential risks and benefits, and confidentiality measures (online supplemental appendix C: Participant Information Sheet). For participants with limited literacy in Nepali, the FGD facilitator provided verbal explanations in the local language. Written informed consent was obtained from all participants prior to their participation in the FGDs.

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