Original Article

International Journal of Convergence in Healthcare

Published by
IJCIH & Pratyaksh Medicare LLP

www.ijcih.com

Development of a Logic Model for Implementing Active Screening and Motivation of Presumptive TB Patients by Involving Nehru Yuva Kendra Sangathan (NYKS) Youth Club Members in India

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Abstract

Introduction: India has setup an ambitious target of TB elimination by 2025. Early detection of TB is extremely crucial. However, majority of the presumptive TB cases report late. This study develops an implementation program logic model involving youth club members of existing Nehru Yuva Kendra Sangathan (NYKS), a government of India enterprise, to provide sustainable and community-driven solution.

Methodology: Study used standard method for developing logic model. This included defining its purpose and scope, and actions including identification of inputs, resources, activities, core interventions, and the expected change viz. outputs and outcomes. The identification of these domains followed by model development, its testing, refinement, and practical utilization.

Results: NYKS Logic model for implementing active screening and motivation of persons with TB suggestive symptoms for timely detection of TB cases has been developed in this study. Different domains and corresponding activities are presented within the 'NYKS Logic Model'. Developed NYKS logic model meticulously outlined (1) input, (2) process, (3) output, and (4) outcome domains and activities (1) Information, Education, and Communication (IEC); (2) Screening; (3) Referral; and (4) Case Detection pertaining to domains. For all included domains and activities, 36 indicators for monitoring were outlined meticulously.

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Discussion: NYKS Logic model serves as a visual representation of relationships between inputs, processes, outputs, and outcomes domains, and their activities. This logic model encompasses four key activities, linking resources, activities, and outcomes with a structured framework. IEC activities are primary step. Screening systematically assesses individuals. Referral activities, directs presumptive TB cases to diagnosis. Finally, case detection, works out as the conclusive stage.

Conclusion: NYKS logic model for TB screening has been developed.

Keywords: *Logic model; Tuberculosis; case detection; active screening; youth volunteer; India.*

Introduction

Ministry of Health and Family Welfare, Government of India formulated the National Strategic Plan (NSP 2017-25) for Tuberculosis Elimination by year 2025 with ambitious and innovative measures[1]. However, by 2020, it became evident that the NSP-2017–25 was unlikely to achieve its objectives[2]. Consequently, NSP India 2025 was introduced in 2020, which reasserts the thrust on early diagnosis, reducing transmission and treating at first interface with right drugs and regimens along with suitable patient support systems[3].

A significant focus of research in the National Strategic Plan 2017 – 2025 is dedicated to figuring out the most effective combination of strategies and interventions for detecting TB cases early in their development[1]. NSP 2025 advocates to undertake research on Case Finding beside others among different high risk populations[3].

Global studies have proven the communities and patients as instrumental in early identification of TB cases[4-7]. However, there is a felt need of well-designed implementation research modelling studies, and health policy research to effectively operationalize and integrate the community workers into existing health systems, ensuring scalability and sustained impact[8,9].

This study aimed to develop an implementation program which provides a sustainable and community-driven solution for early TB case detection in India. A well-structured Implementation Research logic model framework was designed and developed to assist the NTEP by exploring the feasibility of implementing active screening for presumptive TB cases and motivation of persons with TB suggestive symptoms by local community youth volunteers for early reporting for diagnosis. In this study the "Youth Club" members of Nehru Yuva Kendra Sangthan (NYKS) worked out as community health workers.

NYKS is a prominent autonomous youth organization with pan India presence under the Ministry of Youth Affairs and Sports, Government of India. It is dedicated to the holistic development of young people from rural and semi-urban areas. It encourages and empowers the youth to participate in various nation-building activities through an extensive network of district and block-level centres and village-level 'Youth Clubs'. The NYKS 'Youth Club' usually comprise of 10-15 enthusiastic youth volunteers from the local community. The organization operates on the principles of voluntarism, self-help, and community participation[10].

Objective

To develop a robust logic model framework encompassing domains like inputs, processes, outputs, and outcomes with collaborating with NYKS 'Youth Club' members engaged in active screening and motivation of persons with TB suggestive symptoms in local community.

Methodology

Strategy for Development of Logic Model

Tylor *et al.* (2008) defined logic model as a visual representation illustrating a program's objectives, actions, and intended achievements. Comprising four key domains—inputs, processes, outputs, and outcomes—a logic model establishes the logical connections between program resources, undertaken activities, and resulting changes or benefits. The process of developing a logic model involves several steps, including defining its purpose and scope, identifying inputs of resources, activities, outputs, and outcomes, followed by model development, testing, refinement, and practical utilization[11]. Other authors also have emphasized the importance of connecting activities, outputs, outcomes, and long-term impacts in a logic model based on theoretical frameworks and empirical evidence[12-13].

On the basis of these findings in this study the logic model was developed through a comprehensive and strategic process including: (1) Review of government policies, reports and existing relevant scholarly literature, (2) Stakeholder's opinion seeking, (3) development of the draft logic model, (4) refinement and finalization of logic model.

Stage 1 (Review of government policies, reports and existing relevant scholarly literature): It commenced with a thorough review of government of India's old and existing TB control policies. Special attention was given to official guidelines provided by India's National Tuberculosis Elimination Program (NTEP) to understand the existing strategies, protocols, and recommendations for TB detection and management. National Strategic Plan for Tuberculosis Elimination (2017–2025) was also reviewed in the process to gain insights into the overarching goals, priorities, and approaches outlined by the government to eliminate TB[1] (1). Along with this World Health Organization's (WHO) guidelines on TB control and active case finding was also reviewed, it provided a broader perspective and best practices that can be adapted to the Indian context[14]. Government of India's policies related to primary healthcare, community engagement, and health system strengthening was also analysed thoroughly to understand their impact on TB control efforts[15].

A diligent review of published literature was also conducted, encompassing recent and relevant research studies on TB in India. These studies focused on TB control, particularly those discussing innovative strategies, community engagement, and successful case-finding models[16]. Additionally, reports and publications capturing the perspectives of communities and stakeholders involved in TB control efforts in India were also included in the review process. This review has provided valuable insight into the local epidemiology, challenges, and potential solutions for active case finding[17].

Stage 2 (Stakeholder Assessment & Opinion seeking): In the development of this logic model, a comprehensive stakeholder's assessment was undertaken to attain an in-depth understanding of the Nehru Yuva Kendra Sangthan (NYKS) system. This involved a meticulous examination of their organizational structure, operational processes, and overall functioning. Dialogue with NYKS leadership was undertaken by all sites. By delving into the functioning of NYKS, study aimed to grasp the roles and responsibilities of its members, the dynamics within the organization, and the existing framework through which they engage with communities and the level of their engagement through assessing the type of activities and the frequency of their involvement.

Simultaneously, an exploration of the local healthcare system was conducted to get a better understanding. This investigation focused on comprehending the mode of their functioning, the specific roles and responsibilities of healthcare professionals operating at the grassroots level especially Accredited Social Health Activist (ASHA) and Auxiliary Nurse Midwife (ANM), and the challenges they encounter in their work within the villages.

Stage 3 (Development of draft logic model): Following this, an implementation model was developed that outlines the personnel, resources, and various activities essential for the intervention. To effectively monitor and assess the intervention's progress, monitoring indicators were formulated. The logic model is structured around four domains: input, process, output and outcome domains[11-13]. Pertinent activities were designed to fit each of the domains. 1) Information, Education, and Communication (IEC) activities, 2) screening 3) referral 4) case detection activities. Within each activity, study meticulously defined input, process, output, and outcome domains, establishing a comprehensive framework for monitoring. These domains cover aspects such as resource allocation, activity execution, immediate outcomes, and broader community impact. This systematic approach not only facilitates intervention implementation and management but also empowers stakeholders to measure progress and evaluate overall success.

Stage 4 (Refinement and finalization of Logic Model): Following the initial development of the draft logic model, a rigorous refinement process was initiated. This iterative phase was characterized by multiple rounds of stakeholder's feedback and a comprehensive peer review involving all project investigators and coordinators. Seeking diverse perspectives, stakeholders and project investigators provided valuable input, which was meticulously collated and integrated into the model. Refined logic model was then discussed with stakeholders from NYKS and public health system to finalize it. The collaborative nature of this refinement and finalization process ensured a holistic and well-informed approach, incorporating the expertise and insights of all involved parties. This iterative feedback loop not only enhanced the accuracy and relevance of the logic model but also fostered a shared understanding and commitment among the project team. Through this collaborative refinement and finalization process, study aimed to optimize the effectiveness and feasibility of the intervention, aligning it more closely with the dynamic needs and expectations of the stakeholders and the target community.

Result

In Fig 1, a visual description of different domains and corresponding activities is presented within the 'NYKS Logic Model.' For each included activity, input, process, output, and outcome domain indicators are meticulously outlined, creating a thorough framework for monitoring

purposes. These indicators encompass a variety of factors, including the allocation of resources, the execution of activities, immediate outcomes, and the broader impact on the community. This structured approach facilitates a comprehensive assessment, enabling the monitoring of various facets crucial to the success of the model. Fig 2 represent the schema of implementation of NYKS Logic Model by trained volunteers of Youth Clubs. Schema demonstrate the practical work flow of the model involving training of volunteers, population enumeration for identification of high risk families, intervention activities and presumptive case identification and their referral for easy understanding of NYKS Logic Model.

Following activities were included in this logic model:

Information, Education, and Communication (IEC) Activities

For Information, Education, and Communication (IEC) activities, specific inputs were identified for "input" domain of the logic model. These inputs included members of the Youth Club, IEC materials, Standard operating procedures (SOP), and the provision of smartphones for educational videos. Two distinct activities were established for "process" domain of the logic model. These IEC activities processes included: performing IEC activities targeting the general population on a monthly basis and the other focusing on vulnerable groups (people living with diabetes and HIV/AIDS, contacts of pulmonary TB (PTB) patients, people who work in mines or reside near mines, chronic cough patients etc.) within households on a fortnightly basis. For the "output" domain of IEC activities output will be measured by quantifying the number of individuals attending IEC activities and the number of members from vulnerable group households participating in these sessions. These quantifiable outputs will help in assessing the overall outcome of these IEC activities. This outcome will be assessed through the number of individuals made aware of tuberculosis as mentioned in "outcome" domain of IEC activities. To ensure effective oversight of IEC activities, key indicators have been defined across various domains. These following indicators serve as benchmarks and metrics to assess and monitor the performance and outcomes of IEC activities in a systematic manner (Table-1):

Input Indicators:

1. No. (%) of clusters/villages with Youth club.
2. No. (%) of Youth club members oriented to/ trained for IEC materials viz. Standee, Banners, booklet, videos etc.
3. No. (%) of Youth club members with standard operating procedures (SOP) on conducting IEC activities.
4. No. (%) of Youth club members with smart phones for observing educational videos.

Process Indicators:

1. Number of IEC activities undertaken
2. Number of monthly health talks held?
3. No. (%) of houses with vulnerable group members visited for 'family discussion' every fortnight
4. Number of 'Family discussion' sessions undertaken?

Output Indicators:

1. No. (%) of village residents who had received at least 1 IEC activity per month
2. No. (%) of individuals in cluster/village who attended 'Health talk' monthly basis.
3. No. (%) of members of houses of vulnerable groups who received 'Family discussion' for fortnight

Outcome Indicators:

1. No. (%) of persons found aware of TB after 'Health talk'
2. No. (%) of members of vulnerable group HHs found aware of TB after 'Family discussion'

Screening Activities

For the screening activities targeting presumptive tuberculosis (TB) patients, a strategic selection of inputs was determined under the "input" domain of screening activities. This involves training youth club members on the screening process for presumptive cases, providing them with the standard operating procedures (SOP) of screening, and utilizing a screening algorithm to identify potential TB cases. Subsequently, four distinct activities were assigned which are mentioned under the "process" domain of this screening activity: screening by monthly role play activities and health talks, screening by fortnightly group discussions and vulnerable members' household visits. These activities aim to raise awareness about the symptom's indicative of presumptive TB cases, encouraging individuals to seek testing if such symptoms persist or if they are contacts of a PTB positive case. The outputs of these activities are gauged through metrics such as the person made aware about the TB screening through the role plays, group discussions, health talks and through the vulnerable member's home visit as mentioned under the "output" domain. The "outcome" domain of screening activities indicates that, by utilizing these outputs, the outcome of the screening domain can be assessed by how many individuals with presumptive symptoms approached for screening. To ensure effective oversight of screening activities, key indicators have been defined across various domains. These following indicators

serve as benchmarks and metrics to assess and monitor the performance and outcomes of screening activities in a systematic manner (Table-1):

Input indicators:

1. No. (%) of youth club members provided with standard operating procedures (SOP) on screening
2. No. (%) of youth club members trained in screening
3. No. (%) of members with screening algorithm

Process Indicators:

1. No. of 'Role play' activities undertaken
2. No. of 'Group discussion' held
3. No. of 'Health talk' delivered
4. No. of HHs visited to vulnerable member home

Output Indicators:

1. No. of residents made aware about the TB screening through 'Role plays'
2. No. of residents made aware about the TB screening through 'Group discussions'
3. No. of residents made aware about the TB screening through 'Health talks'
4. No. of residents made aware about the TB screening through Vulnerable members household visits.

Outcome Indicators:

1. No. of persons with presumptive symptoms approached for screening
2. No. of persons found with presumptive TB
3. Number of contacts of PTB patient approached for screening
4. number of contacts screened for TB

Referral

In the referral activity of presumptive tuberculosis (TB) cases led by community volunteers, a systematic approach has been established. The initial step involves providing comprehensive training to these volunteers on the intricacies of the case referral process. This includes familiarizing them with the case referral slip and equipping them with a data register, as mentioned under the "input" domain of referral activities. Subsequently, as indicated in the "process" domain, the community volunteers are entrusted with the responsibility of referring presumptive TB cases for medical check-ups whenever necessary. "Output" domain of the referral activity shows that the output of this activity is quantified through the number of presumptive cases referred, accompanied by a referral slip, for medical check-ups. The cases can also be connected to ASHA for sputum collection and testing. The impact of this referral process is further evaluated by assessing the number of presumptive cases that finally consult for medical examinations or get sputum tested for TB, as mentioned under the "outcome" domain part. To ensure effective oversight of referral activities, key indicators have been defined across various domains. These indicators serve as benchmarks and metrics to assess and monitor the performance and outcomes of referral activities in a systematic manner (Table-2):

Input Indicators:

1. No. (%) of club members with 'Case referral slip'
2. No. (%) of members provided training on case referral
3. No. (%) of club members provided with Data register

Process Indicators:

1. No. (%) of club members referring the presumptive cases/contacts of PTB cases for medical check up
2. No. (%) of club members maintaining the record of referred presumptive cases/contacts of PTB cases in Register for follow up

Output Indicators:

1. No. (%) of referred presumptive cases/contacts of PTB patients with referral slip reached for medical check up

Outcome Indicators:

1. No. (%) of referred presumptive cases examined by MO for TB
2. No. of contacts of PTB patients screened by MO for TB

Case Detection

In the case detection phase of this tuberculosis (TB) intervention, volunteers who have access to smartphone for diagnosis data collection, will be provided access to the contact details of the Medical Officer (MO) and Laboratory Technician (LT) as mentioned in the "input" domain of case detection activity. Subsequently, as indicated under the "process" domain of this case detection part primary responsibility of these volunteers for case detection activity involves obtaining the results of medical check-ups/investigations and collecting updates on enrolled cases from the Directly Observed Treatment, Short-course (DOTS) provider on a fortnightly basis. The output of this activity will be determined by the total number of cases identified as positive for TB as mentioned under the "output" domain section. "Outcome" domain indicates that the broader impact, this case detection activity has brought can be evaluated by comparing the TB case detection status against the baseline rate. To

ensure effective oversight of case detection activities, key indicators have been defined across various domains. These indicators serve as benchmarks and metrics to assess and monitor the performance and outcomes of case detection activities in a systematic manner (Table-2):

Input Indicators:

1. No. (%) of youth club members provided with contact details of MO & LT
2. No (%) of club members with access to smartphone for diagnosis data collection & transmission

Process Indicators:

1. No. (%) of youth club members obtaining results of medical checkup & lab examination
2. No. (%) of youth club members receiving updates on enrolled case if any from DOTS provider

Output Indicators:

1. No. (%) of presumptive cases found positive for TB
2. No. of contacts of PTB cases found positive for TB

Outcome Indicators:

1. TB case notification rate in No. of cases notified/100,000 population for the area and number initiated on anti-TB treatment
2. Number of contacts initiated on TPT.

Discussion

A logic model serves as a visual representation of a program, elucidating the relationships between inputs like available resources, activities and interventions, outputs, outcomes, and impact. Its key components include defining the program's ultimate goal and required resources (inputs), specifying the actions taken to achieve goals (activities), outlining the direct results of these actions (outputs), and delineating the short-term, intermediate, and long-term changes targeted by the program (outcomes). Various types of logic models exist, such as linear models illustrating straightforward cause-and-effect relationships, interactive models reflecting complex interdependencies, and outcome mapping focusing on changes in behaviour and relationships. In public health, logic models play a crucial role in planning, implementing, and evaluating programs. They assist in resource identification, activity planning, and progress tracking, fostering a systematic approach to addressing complex health issues. Overall, logic models offer a structured framework for program development and evaluation in public health, contributing to more effective interventions and improved health outcomes[11,13].

Several studies have proposed logic models for tuberculosis (TB) prevention and treatment. These models exemplify a global approach to tackling the complexities of TB control. The TB REACH Wave 10 Logic Model Framework offers a comprehensive guide that emphasizes health systems strengthening, covering five key components: Intervention Goals and Objectives, Inputs (Activities), Intervention Outputs, Intermediate Implementation Outcomes and health systems strengthening Impact (Long-term). This framework serves as a dynamic tool for planning and evaluating interventions, providing a structured approach that encourages adaptability over time[18]. Similarly, the DOTS Implementation Logic Model underscores the importance of training, standard operating procedures, and monitoring in the successful implementation of the Directly Observed Treatment, Short-course (DOTS) strategy. By evaluating external, organizational, implementation, and effectiveness contexts, this model offers a holistic perspective on TB control efforts[19]. While the Tuberculosis Treatment Management Logic Model places a spotlight on inputs, processes, outputs, outcomes, and impact, providing a comprehensive framework for evaluating and improving the management of TB treatment[20]. Whereas, the Public Health Tuberculosis Logic Model adopts a systematic approach, emphasizing inputs, participation components, outputs, and outcomes to coordinate and deliver TB prevention services[21].

Similar to this several studies have also offered insights into the logic models used in India. These logic models tailored to the local context offer insights into the challenges and successes of TB interventions. The Revised National Tuberculosis Control Program Evaluation Logic Model represents a comprehensive approach to evaluating the specified region. The evaluation spans a 5-year period (2001-2005) and involves collaboration with health offices, guidance from the National Institute of Epidemiology, India, and a meticulous analysis of program performance. Within this evaluation framework, the logic model serves as an integral component, providing a structured representation of inputs, processes, outputs, and outcomes. This combined approach ensures a systematic and detailed assessment of the TB control efforts in Kangra, Himachal Pradesh, facilitating a nuanced understanding of the program's impact and effectiveness[16,22]. The Centre for Disease Control and Prevention's Division of Tuberculosis Elimination has provided a detailed logic model as part of the evaluation plan for the "Completion of Treatment for Tuberculosis Disease by Using Incentives and Enablers." This model intricately outlines the relationships between

resources, activities, and outcomes within the TB program, identifying inputs such as funding and staffing as essential for program execution. The model provides a range of interventions as activities and specifies tangible outputs, short-term, intermediate, and long-term outcomes. Tailored for TB program evaluation, this logic model serves as a crucial tool for planning and assessing program effectiveness by providing a structured framework to understand the program's theory of change[23].

It is against this background that this study developed a logic model for active screening and motivation of presumptive TB cases by community volunteers who are registered as members of an organized system under Ministry of youth Affairs and Sports, Government of India and are already involved in various voluntary activities in their respective villages, local areas. This logic model encompasses four key activities, intricately linking the available resources (manpower), activities, and outcomes with a structured framework, the model facilitates a comprehensive strategy to manage the complexities inherent in tuberculosis management.

Information, Education, and Communication (IEC) activities

Information, Education, and Communication (IEC) activities are recognized as a pivotal and primary step in the logic model as shown in Fig 1, serving as the cornerstone for initiating active TB screening and motivating individuals with symptoms suggestive of tuberculosis. As detailed in result section the meticulously designed NYKS logic model for IEC activities targeting tuberculosis awareness encompasses clear inputs, processes, outputs, and outcomes.

Inputs, such as involving youth members of NYKS in TB related activities, utilizing IEC materials, providing standard operating procedures (SOP), and employing smartphones for educational videos, ensure a comprehensive approach to address the multifaceted challenge of tuberculosis. The subsequent processes involve regular activities for the general population and more frequent sessions for vulnerable groups as shown in Fig 2, catering to diverse audience needs in their respective areas/villages.

The outputs, measured by attendance and participation, gauge the immediate impact of these activities. Meanwhile, outcomes, measured by the number of individuals made aware of tuberculosis, reflect the ultimate goal of these initiatives. This systematic approach not only facilitates efficient resource allocation but also supports continuous improvement in tuberculosis awareness efforts.

Numerous studies underscore the critical role of IEC activities in the effective management of tuberculosis. Collectively, these studies emphasize the potential of IEC activities to increase awareness, enhance patient care, engage communities, facilitate coordination with health staff, and ultimately improve TB control outcomes. IEC activities play a vital role in early detection and reporting of cases, contributing significantly to disease control. The positive influence of IEC activities has been reported to extends beyond individuals to the community level, fostering enhanced engagement in TB control efforts in India and abroad[24-26]. For instance, a study in Odisha, India, revealed that sensitization activities not only improved Interpersonal Communication Skills (IPC) but also bolstered community confidence in managing TB. Importantly, IEC interventions contribute to fostering better coordination and collaboration among various levels of health staff, as exemplified in the Odisha study. This synergy is instrumental in achieving more effective TB control outcomes, reflected in improved indicators such as referrals and case finding[25]. The Central TB Division's guidelines for the programmatic management of TB preventive treatment in India also include IEC materials as part of the National TB Elimination Program activities, emphasizing the strategic importance of Information, Education, and Communication initiatives in the broader context of tuberculosis control[26].

The significance of the first component of the NYKS logic model, as outlined, underscores the comprehensive impact of IEC activities on tuberculosis awareness and control, highlighting their role as a linchpin for successful TB management.

Screening Activities

The second step in the NYKS logic model involves NYKS youths undertaking screening activities, positioning them as pivotal measures following IEC efforts, to systematically identify and assess individuals as potential TB cases (Fig 1 & 2). The logic model for screening activities targeting presumptive tuberculosis (TB) patients is meticulously crafted with a focus on key inputs, processes, outputs, and outcomes to enhance the effectiveness of TB management. In the realm of screening, a thoughtful selection of inputs involves training youth club members, providing essential SOPs for screening, and employing a screening algorithm to identify potential TB cases. The subsequent delineation of four distinct activities in the process domain, encompassing monthly role plays, health talks, group discussions, and household visits to vulnerable members, underscores the model's holistic

approach to raising awareness about TB symptoms. Outputs, measured through metrics such as individuals made aware of TB screening, provide tangible indicators of the activities' impact. The model's outcome domain emphasizes the practical assessment of success by gauging how many individuals with presumptive symptoms actively approach for screening. Furthermore, the incorporation of key indicators across domains ensures a systematic and comprehensive oversight, facilitating a structured evaluation of the screening activities.

Numerous studies underscore the significant benefits of screening activities in the effective management of tuberculosis (TB). The World Health Organization (WHO) conducted a study revealing that systematic screening for TB not only benefits individuals but extends its impact to the broader community by reducing TB prevalence and preventing future disease[27]. The Centre for Disease Control and Prevention (CDC) recommends targeted screening particularly for high-risk groups, such as those in close contact with TB patients, immunosuppressed individuals, and healthcare workers[28]. A systematic review affirmed that TB screening plays a crucial role in identifying patients earlier in their clinical course, consequently enhancing their clinical outcomes[26]. In summation, these studies collectively emphasize the pivotal role of screening activities in TB management, showcasing their potential to not only reduce TB prevalence but also to identify cases earlier, improve health outcomes, and mitigate tuberculosis transmission within the community.

Referral Activities

The subsequent step in the logic model focuses on case referral activities, underscoring their importance as a sequential process following screening, aimed at directing identified potential TB cases towards diagnostic and therapeutic services and management. The referral activity for presumptive tuberculosis (TB) cases led by NYKS youth members as community volunteers is marked by a systematic and well-structured approach. Through comprehensive training, these NYKS community volunteers are equipped with the necessary knowledge of the case referral process, including the use of referral slips and data registers, enhancing their effectiveness in facilitating referrals. The process domain entrusts these volunteers with the crucial responsibility of referring presumptive TB cases for medical check-ups, emphasizing the role of grassroots engagement in the healthcare system. The quantifiable output of this activity, measured by the number of presumptive cases referred with accompanying slips, provides tangible metrics for the success and reach of the referral process. The outcome domain assesses the impact by evaluating the number of referred cases that ultimately consult for medical examinations, shedding light on the efficacy of the referral system in facilitating timely healthcare access. The defined key indicators across domains play a pivotal role in ensuring effective oversight, serving as benchmarks for assessing, monitoring, and continually improving the performance and outcomes of the referral activities in a systematic and comprehensive manner.

Case Detection

The final step in the logic model centres on case detection, emphasizing its critical role as the conclusive stage following case referral activities, ultimately leading to the identification and confirmation of tuberculosis cases for prompt intervention and treatment. In the case detection phase of the tuberculosis (TB) intervention, a crucial emphasis is placed on empowering volunteers with smartphone access for diagnosis data collection. The "input" domain ensures that these volunteers have direct contact details for the Medical Officer (MO) and Laboratory Technician (LT), establishing a foundation for streamlined communication and collaboration. The subsequent "process" domain underscores the primary responsibility of volunteers in obtaining medical check-up/ investigation results and collecting updates on enrolled cases from the Directly Observed Treatment, Short-course (DOTS) provider on a regular basis. The measurable "output" of this activity is determined by the total number of cases identified as positive for TB, providing a tangible indicator of the intervention's impact at the ground level. The "outcome" domain evaluates the broader impact of the case detection activity by comparing the TB case detection status against the baseline rate, providing insights into the effectiveness of the intervention over time. To ensure effective oversight, key indicators have been thoughtfully defined across domains, serving as benchmarks and metrics to systematically assess, monitor, and enhance the performance and outcomes of case detection activities.

Typical Indian village is represents a conglomeration of different micro-climate zones, local terrains, and socio-economic communities. Youth club members also come from diverse characteristics of their village representing every part and corner of village. Public Health system of India provides Accredited Social Health Activist (ASHA) as the most peripheral health worker at the village level. Auxiliary Nurse Midwife (ANM), another peripheral health worker in India, caters services to about 2-5 villages through

Health Sub-centre. Given the diverse heterogeneity in any typical Indian village and limited availability of peripheral health workers, it is prudent to deploy possible community members representing diverse characteristics of any typical Indian village in TB screening. NYKS youth club members can be such community members which come from diverse background and different parts of village. Because of their diversity and proximity to village community, NYKS Youth club members will have more acceptability among community and penetration for outreach activities. These are the reasons, NYKS youth club members were chosen as key input in the developed NYKS Logic Model.

Conclusion: This study thus develops a logic model for active screening and motivation of persons with TB suggestive symptoms and other vulnerable population in their local community with the help of members of Nehru Yuva Kendra Sangathan (NYKS), Feasibility of the model need to be assessed in programme setting. The involvement of the already existing group of youth members who are registered under NYKS as volunteers in the TB screening programme for early TB case detection would help the National TB elimination Programme in strengthening its case finding activities. The effort will also empower the community in seeking early medical intervention by gaining knowledge about TB through regular interaction with the local youths. This would also set an example of convergence of the resources for empowering the community and tackling one of the most severe health problem in the country.

Acknowledgments: This work was supported by ITRC-ICMR.

Authors' Contributions: MS contributed to conceptualization of study and led the trial Protocol development, contributed to the first draft and finalized the manuscript, was involved in project administration, PKA, AK, SS, SG, AP, VNRD, BVB, SB, KP contributed to the data acquisition, contributed to finalization of the manuscript, BVB, KP provided administrative support and provided inputs on draft manuscript, BSG, MSC, RR contributed to protocol development , HT, MSS contributed to manuscript writing, All authors reviewed and approved the final version.

Competing Interests: The authors declare that they have no competing interests. India TB Research Consortium (ITRC), Indian Council of Medical Research (ICMR), is the sponsor of the study.

Funding: India TB Research Consortium (ITRC), Indian Council of Medical Research (ICMR), funded the study.

Table 1: Indicators to study for 'IEC activities and 'Screening' activities under 'Logic model'

	IEC activities	Screening
Input	• No. (%) of clusters/villages with Youth club • No. (%) of Youth club members with IEC materials viz. Standee, Banners, booklet, videos • No. (%) of Youth club members with standard operating procedures (SOP) on conducting IEC activities • No. (%) of Youth club members with smart phones for showing educational videos	• No. (%) of youth club members provided with standard operating procedures (SOP) on screening • No. (%) of youth club members trained in screening • No. (%) of members with screening algorithm
Process	• Number of IEC activities undertaken • Number of monthly health talks held? • No. (%) of houses with vulnerable group members visited for 'family discussion' every fortnight	• No. of 'Role play' activities undertaken • No. of 'Group discussion' held • No. of 'Health talk' delivered • No. of HHs visited to vulnerable member home
Output	• No. (%) of village residents had received at least 1 IEC activity per month • No. (%) of individuals residing in cluster/village attended 'Health talk' at for the month • No. (%) of members of houses of vulnerable groups received 'Family discussion' for fortnight	• No. of residents made aware about the TB screening through 'Role plays' • No. of residents made aware about the TB screening through 'Group discussions' • No. of residents made aware about the TB screening through 'Health talks' • No. of residents made aware about the TB screening through Vulnerable members household visits.
Outcome	• No. (%) of persons found aware of TB after 'Health talk' • No. (%) of members of vulnerable group HHs found aware of TB after 'Family discussion'	• No. of persons with presumptive symptoms approached for screening • No. of persons found with presumptive TB

Fig 1: NYKS Logic Model

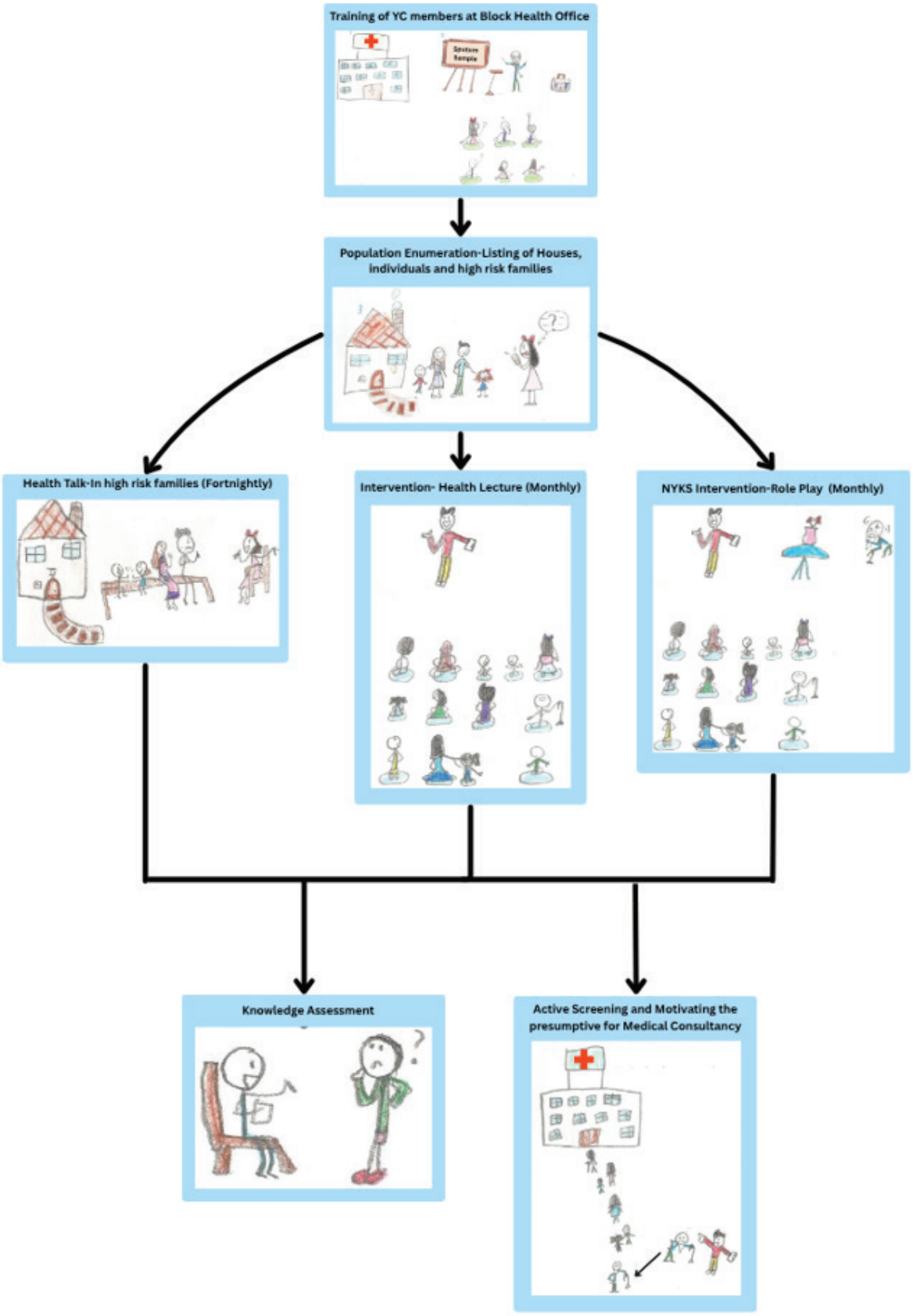

Fig 2: NYKS Logic Model Schema of activities
(Drawing courtesy Ms Aarna Anand (Chhota), Vth class, Delhi Public School, Pali Road, Jodhpur)

Table 2: Indicators to study for 'Referral' and 'Case detection' activities under 'Logic model'

	Referral	Case detection
Input	• No. (%) of club members with 'Case referral slip' • No. (%) of members provided training on case referral • No. (%) of club members provided with Data register	• No. (%) of youth club members provided with contact details of MO & LT • No (%) of club members with access to smartphone for diagnosis data collection & transmission
Process	• No. (%) of club members referring the presumptive case for medical check up • No. (%) of club members maintaining the record of referred presumptive cases in Register for follow up	• No. (%) of youth club members obtaining results of medical checkup & lab examination • No. (%) of youth club members receiving updates on enrolled case if any from DOTS provider
Output	• No. (%) of referred presumptive cases with referral slip reached to medical check up	• No. (%) of presumptive cases found positive for TB
Outcome	• No. (%) of referred presumptive cases examined by MO for TB	• TB case notification rate in No. of cases notified/100,000 population for the area

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