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Research Article

Understanding Reasons for Lack of Effectiveness of National tb Program in Peru: Qualitative Analysis of Mdrtb Control.

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1.Introduction

Drug-resistant tuberculosis (DR-TB is the most urgent public health problem to solve in Peru, according to the Ministry of Health. In the WHO Global TB Report 2021, Peru has the highest burden of DR-TB in the Americas (Table 1), with 38% of TB cases either RR or MDR. In addition, the Ministry reports an estimated prevalence rate of DR-TB of 5.7% in new cases and 24.2% in previously treated cases. A total of 2493 new cases of DR-TB were reported in 2022, with 18.5% treatment dropout in 2019 believed to have increased by at least 52% in 2022 [1].

The post-pandemic context has created additional challenges for the control of DR-TB in Peru. A complex multiplicity of factors connects this disease to groups with high vulnerability, such as populations in extreme poverty and overcrowding or deprived of freedom; those who have immune system disorders, such as HIV and diabetes; and isolated indigenous populations. Peru's national DR-TB control program, implemented since 1996, has shown an uneven performance, compared to other countries in the region, as shown in the WHO World TB Report 2021 (Table 1).

Table 1: Selected Countries with highest Rifampicin Resistant (RR) and MDR TB reported cases

Country	Reported MDR/RR-TB cases		
	Number	Percentage	Rate
Peru	1424	38%	4.3
Brazil	881	23%	0.4
Mexico	270	7%	0.2
Ecuador	253	7%	1.4
Dominican Republic	149	4%	1.4
Colombia	134	4%	0.3
Argentina	110	3%	0.2
Bolivia (Plurinational State of)	98	3%	0.8
Haiti	93	2%	0.8
Guatemala	77	2%	0.4
Total	3489	92%	

Note: Rates per 100 000 population.
MDR/RR-TB: multidrug-resistant or rifampicin-resistant tuberculosis.
Source: World Health Organization. Global Tuberculosis Report 2021. Geneva: WHO; 2021. Available at: https://www.who.int/publications/i/item/9789240037021

2. Methodology

To explore reasons for the ineffectiveness of Peru´s TB Program, we conducted a qualitative study with a group of NTB Program managers. Interviews were conducted with 102 individuals (out of 162 from the sample framework sampled accordingly with sampling method), all national and provincial NTBP managers. They were asked about the main reasons for poor outcomes of MDRTB control in Peru, and to understand its strengths, weaknesses and current implementation failures.

A structured interview guide, based on a prior WHO survey for evaluating TB services, was piloted with managers, and then modified based on pilot responses. The interviews were conducted in Spanish by one individual (SM), in one or two meetings lasting a maximum of 15 minutes each. All interviews were recorded and then transcribed in Spanish, translated into English, and entered into the NVIVO V11 software program for Windows NVIVO assigned responses with 3 possible conceptual codes: (1 providers, (2 patients, and (3 policy considerations[1-15].

2.1 Dependent Variable

Effectiveness of the NTBP, according to four indicators:

- Delay in diagnosis
- Lack of Adherence to treatment LTFU
- Failure of treatment
- Mortality

2. 2 Inclusion Criteria For Interviewees:

- TB health managers who were health personnel dedicated to the health care of people living with MDR-TB, and
- Working continuously during six or more than six months of experience in the care of MDR-TB patients and
- Whose position involved decision making or administrative management of the program, regardless of their profession, and
- Belonging to one healthcare type: Physicians, nurses, psychologists, dentists, nutritionists, physiotherapists, and midwives.

2.3 Data Collection

Closed-ended surveys and structured interviews were conducted with the selected individuals, to obtain their opinion on the performance of the NTBP (according to the four indicators above), and possible solutions to performance problems.

2.4 Informed Consent

was obtained from 162 NTBP managers, divided into two groups: 60 took a online survey (See Annex 2 for the Google form used to select the key performance outcomes for the NTBP (they selected the four key indicators above); and 42 in a different group were interviewed for 15 minutes in person to ask their opinions about the main causes for poor performance of Peru´s NTBP in control of MDRTB. To ensure the confidentiality of their interviewees, each person signed an Informed Consent agreement assuring that their identity would be protected. See Informed consent used in Annex Number 1.

2.5 Definition Of Performance Indicators

The four outcomes selected by the first group of interviewees (and the current values using the SIGTB1 are:

- Delay In Diagnosis: Delay in diagnosing DRTB, including drug sensitivity testing and contact study screenings, especially in high-risk contacts (currently, median delay of 57 days (interquartile range: 28-126)).
- Lack Of Adherence To Treatment (LTFU): The patient's inability or refusal to take TB medications according to prescribed by health professional (currently, 30.6% (CI 24.3-41.3% LTFU).
- Failure Of Treatment: When the treatment regimen is carried out effectively and the patient, after completion of treatment, still shows positive sputum examination (currently, 3.9% (CI 1.3-4.9%))
- Mortality: When death is attributed to MDRTB as the direct cause of death (currently, 5.1% (CI 4.2-7.8)

Table 2: Tuberculosis Health Services As Total Frame To Calculate The Study Sample For The Qualitative Research, Using By Simple Random Sampling Method.

TB Health Services Type	Year 2021
Hospitals	591
Health Care Centers (PHC)	2,717
Health Post (PHC)	8,904
Total	12,212

Then, applying purposive sampling, we selected participants who possess relevant experience on tuberculosis clinical, operational and programmatic management, ensuring each one can provide insights into the causes for the ineffectiveness of Peru´s TB Program. The criteria for participant selection considered factors such as number of years of experience as NTBP manager, type of health service where the person works, occupation, expertise, specific experiences related to clinical, operational, and programmatic expertise.

We identified an initial set of participants who met the selection criteria and asked them to rate on a scale the most relevant programmatic outcome indicators to evaluate the effectiveness of the NTBP. After obtaining the selected outcome indicators, we proceeded to target individuals who are recognized experts or key informants in the clinical, operational and programmatic management of NTBP. Once potential participants were identified, we contacted them to explain the research purpose, the method to ensure confidentiality, the interview process, and how their information would be used and how their privacy would be protected. We requested their participation by signing the informed consent agreement. The number of participants selected has been based on the research scope, and the richness of data required. We continued sampling until reaching a point of data saturation or theoretical saturation, ensuring that a sufficient depth of understanding was achieved.We used a total simple random sampling method, with EPI INFO V 12.0 for Windows, according to the Population Survey design study. The Pop-

ulation Survey with design effect cluster =1 Confidence level=80%, 50% of expected frequency and error margin of 5%, as shown in Table 2. The initial calculated sample was 162 with loss of 5% during the study, resulting in 102 managers interviewed (40 national staff and 62 from provincial level out of 12,212 total.

2.6 Qualitative Methods Used For This Study

Several qualitative methods were used in this study to assess the reasons for poor performance of Peru's NTBP. An online Google Form-based survey was conducted with 60 managers, to identify the key indicators of performance for Peru's MTBP. The most commonly cited four indicators were selected through a process of voting by participants. This process identified the main outcome variables (delay in diagnosis; lack of adherence to treatment; failure of treatment; and mortality).

Face-to-face interviews were then conducted with 42 managers. The interviews were conducted in Spanish, transcribed and translated into English. NVIVO V 11 for Windows software was used, creating three final conceptual codes and analysis of the qualitative data. Two focus groups were organized through the Google Meet platform with two people in each group, with the use of participatory digital tools (Jamboard, Kahoot that facilitate the recording of information and generate a participatory dynamic. These focus groups addressed the same issues as the individual interviews, in order to select the most important factors contributing to the poor performance of the NTBP. Annex 3 provides the text of the closed-ended online survey and the questions used in the semi-structured interviews.

2.7 Limitations

This study has various limitations:

- ***Subjectivity And Bias:*** The interviews with participants and subsequent analysis may be influenced by the interviewer's personal biases, assumptions, and preconceptions. We sought to minimize the potential biases by using the Conceptual codes given by NVIVO software.
- ***Sampling Method:*** The participants selected through purposeful sampling may not be statistically representative, but the sampling method could still generate useful insights and understanding of the problems with effectiveness of Peru´s NTBP and could also help propose solutions.
- ***Social Desirability Bias:*** The participants in interviews may respond in ways that they think can please the interviewer. To address this potential limitation, we ensured total confidentiality on the responses, and emphasized that there are not correct responses.
- ***Recall Bias:*** To reduce the unintentional omission or distortion of information, we conducted the interview in a flexible and dynamic semi-structured interview method.
- ***Time And Resource Constraints:*** The interviews were time-consuming and resource-intensive, which could influence the quality of the information collected. To recruit participants, conduct interviews, transcribe and analyze data, and derive meaningful insights, we received the support and collaboration of Peru's NTBP, Asociacion Latino Americana de Torax (ALAT), and Sociedad Peruana de Neumologia.

2.8 Lack Of Standardization

This study used methods that do not have strict standardization. By not proceeding with structured surveys, we gave flexibility in the interview process, allowing for deeper exploration of the experiences of NTBP managers. However, this flexibility could also result in variations in the data collected. Standardization did occur, however, in the use of the NVIVO coincidence rate.

In this study, we sought to mitigate all of these limitations through rigorous methodology and careful analysis and interpretation of the collected data.

3. Results

The main results of the study are presented in Table 4 below, with a synthetic summary of the most important findings in the text below, for each of the four indicators of poor performance of Peru's NTBP.

Table 3: Factors Contributing To Poor Performance Of Peru's Ntbp 3.1 Delay in resistance diagnosis.

Four Indicators of Poor Performance of Peru's NTBP	Factors Related to Providers	Factors Related to Patients	Factors Related to Policies
Delay in Resistance diagnosis	Skilled HCW concentrated at hospital level Misclassification of RR, MDR, RI: lack of training. At ESSALUD protocols demand RR patients must be hospitalized. Overfocus in high specialized TB services.	Educational boundaries Competing prioritization: Economic needs survival /Health related needs Lack of trust in HCW capacity/skills at PHC. Cultural, social and ethnic diversity, are a setback. HS not designed for it.	Poor incentives to alter PHCs' HCW practices. Misallocation of resources overfocus on hospitals, versus lab at point of care, contact tracing, community based funded services. Centralization
	Lack of RR & RR, MDR, Rapid test identification laboratory methods at community and point of care level	Stigma- Discrimination- Poor sensibilization, lack education, competing prioritization Informal workers: health services seek behaviors.	The poorest bear the financial burden. Bureaucratic barriers, mean that 12% to 45% of the annual budget for MDR-TB control is not spent.

Lack of Adherence to treatment	Negative attitudes toward MDR-TB patient. Old drug scheme too long treatments, high toxicity. Miss classification of RR as MDR or IR	Health-seeking behaviors (following hemoptysis). Competing needs Self-medication Practices of the private clinic	Lack of political will. International aid undermined institutional strengthening. Lack of Resources at PHCL
	No interdisciplinary team's Poor capacity at PCH. Lack of HR, Mental health services. Conflict of interest Pneumologist.	Increasing burden of mental illness, substance's abuse. High rate of migration internal external	Lack of follow up of HLTBC. Financing Inequity in HC delivery to MDRTB. Policy: recent March 25ª, 2023 approved new drugs short treatment scheme.
Treatment failure	Inefficiency in financing approved protocols & guidelines. Lack of knowledge-resources to search for co-morbidities. Bad TB Drugs quality	High comorbidities burden. Health-seeking behaviors: Too late. The severity of the illness	Centralized purchases. Inequity in financing MDR TB management Lack of governance to implement new drugs policy. Poor understanding of the economic consequences. Lack of Modeling exercise
	Lack of drugs supply, and medical devices equipment to perform diagnosis of comorbidities. Chain supply shortage.	Motivations for Self-medication for MDR. Private clinics.	
High Mortality Burden	Lack of capacity to perform earliest diagnosis.	Initial reactions to symptoms. Poor Knowledge prior to infection. Health seeking behaviors	Catastrophic expenditures, not covered by Health Insurance. (Pulmonary complications, severe Respiratory failure) High OOPE due to dysregulation
	Lack of skills to manage severity of respiratory insufficiency, pulmonary diseases & comorbidities.	Seek for hospitals care when other alternatives failed as the last resource, late seeking of HC	Lack of understanding of the importance of mortality due to MDRTB. Disregard of AVISA and YALY due MDRTB

Providers: Providers lack sufficient rapid molecular tests (such as GenXpert at the primary care level, hindering early diagnosis. Providers also often face low motivation and incentives in treating TB. They are undervalued by the health system and overwhelmed by heavy workloads without tangible outcomes, compounded by their perception of a lack of effective governance and leadership. Skilled healthcare workers tend to be concentrated at the hospital level, leading to the misclassification of resistant tuberculosis cases in the community. Providers lack adequate availability of GenXpert at the primary care level, hindering the timely diagnosis of drug resistance.

Patients: Patients delay their revisits to health facilities for potential TB diagnosis due to their competing priorities between economic survival and health problems, coupled with their educational limitations. These factors also contribute to a lack of trust in the capacity and skills of healthcare workers at the primary healthcare level. Policymakers tend to disregard cultural, social, and ethnic diversity in Peru, so that the TB healthcare system is not adequately designed to address these challenges. In addition, managers report that health-seeking behavior is affected by stigma, discrimination, and poor awareness, especially among informal workers.

Policies: Managers perceive a lack of effective incentives to drive changes in TB treatment practices at the primary healthcare level, resulting in a misallocation of resources. There tends to be a disproportionate focus on hospitals rather than investing in point-of-care laboratories, contact tracing, and community-based funded services. These factors contribute to delays in diagnosis. Furthermore, excessive centralization in financing, evaluation, and supervision of resources allocated for controlling multidrug-resistant tuberculosis (MDRTB leads to bureaucratic barriers. These barriers result in significant unspent portions of the annual budget (ranging from 12% to 45%), contributing to inadequate capacity for TB diagnosis. In addition, international aid has shown limited alignment with the National Plan for Prevention and Control of Tuberculosis, while political decision-makers prioritize investment in highly complex tertiary care without extending funding to community-based services for TB.

3.2 Lack Of Adherence To Treatment

Providers: Providers are confronted with the persistence of an outdated treatment regimen, relying on injectable drugs and lasting over 12 months, leading to major challenges in patient adherence. They also lack a multidisciplinary approach using MDR-TB teams, and tend to rely only on doctors and nurses. There is an urgent need to incorporate mental health specialists, anthropologists, psychologists, social workers, architects or urban planners to address the broader social determinants of the MDRTB phenomenon, and assist in promoting adherence.

Patients: Patients tend to practice self-medication and seek medical care from the private sector, both of which contribute to lack of adherence to appropriate treatment. Moreover, there are significant problems in follow-up patients, due to a growing burden of mental illnesses and substance abuse, alsong with high rates of internal and external migration. Policies: According to managers, political leaders lack attention to adherence as a policy problem. In addition, international aid efforts have not supported institutional strengthening at the primary care level. The shortage of resources allocated to the primary care level, including community-based activities, has exacerbated the challenges faced in delivering effective healthcare services (including community health workers that can assure continuous TB treatment for vulnerable populations.

3.3 Treatment Failure

Providers: According to managers, the protocols and guidelines for TB treatment are comprehensive and appropriate, but they lack financing for implementation. As a result, providers confront a shortage of drug supplies and medical equipment needed for treating TB and comorbidities, contributing to high rates of treatment failure. Providers also lack TB medicines of an assured quality, which contributes to treatment faiklure.

Patients: Patients often arrive with other comorbidities, particularly diabetes, hypertension, and recently Covid-19, making treatment both expensive and difficult, contributing to treatment failure. Also, patients tend to wait in seeking healthcare until they feel severely ill or when their ability to work is compromised, resulting in delayed medical attention. This, coupled with motivations for self-medication and the pursuit of alternative treatments or private clinics, further contributes to treatment failure.

Policies: High rates of TB treatment failure are not considered an important policy question at the central level in Peru. This is reflected in inadequate attention to the implementation of new treatment methods and drugs for TB, problems in procurement and distribution of new TB medicines, problems in the quality of TB medicines, and the lack of modeling analysis of the economic consequences related to treatment failure. Additionally, there is a lack of interest in economic effects of co-morbidities.

3.4 High Mortality Burden

Providers: The high mortality rate for TB results from the difficulties that providers contront in performing early diagnosis of resistant TB, resulting in delays in identifying and treating conditions promptly. Additionally, healthcare professionals face a lack of training in managing respiratory failure, which is a major factor in mortality. This which includes addressing the severity of respiratory insufficiency, pulmonary diseases, and associated comorbidities.

Patients: Patients' health seeking behavior tends to contribute to high mortality. Individuals tend to react to symptoms only when they become noticeable, indicating a lack of prior knowledge about TB risks. Due to competing priorities, patients often decide to seek hospital care as a last resort when other alternatives (such as self-care or traditional care have failed, leading to a higher risk of TB mortality.

Policies: Social security heatlh insurance provides coverage for basic care related to respiratory problems, but respiratory failure often incurs catastrophic expenditures that are not covered. This leads to high out-of-pocket expenses and sometimes to treatment problems that contribute to high TB mortality. According to managers, policymakers do not adeaquately understand the significance of TB mortality caused by multidrug-resistant disease.

Recommendations

The recommendations on how to improve the effectiveness of performance of Peru's NTBP are based on results from the second phase of interviews, involving face-to-face interviews with managers (40 participants).

- Diagnosis Delay: In order to reduce the MDRTB diagnosis delay, there is a need to expand and finance GenXpert molecular tests and introduce rapid resistance diagnosis methods such as Truenat at the point of care—especially at the provincial level (to avoid sending samples to Lima). Efforts should be made to use the annual budget more completely on rapid molecular diagnosis methods. The goal should be to effectively reduce the time for resistance diagnosis at the district and province levels, with a focus on the most geographically affected areas.
- Lack Of Adherence To Treatment: To improve adherence to treatment, all community health workers should be trained in how to manage followup of patients. The training should include early and appropriate clinical recognition of RR, RI, and MDR comorbidities. Increased financing is needed to improve contact trace capacity, training, monitoring and evaluation.
- Treatment Failure: To address failures in medication, it is important to implement and finance the new legal framework of 2023, including new drugs and general use all over Peru (Norma Tecnica Sanitaria No. 200/25 March 2023; or NTS 200). This will help increase the capacity for rapid diagnosis and treatment of Acute Severe Respiratory Failure related to treatment failure. Local health workers need to be trained on effective use of budgets, to increase the spending of the annual budget provided to facilities and prevent budget deviation to other programs (45% of the budget is currently returned to the Ministry unused). New modern TB drugs need to be registered, procured, and effectively used by providers, along with increased accountability of drug quality. Providers need to be trained and encouraged to use the new treatment scheme.
- High Mortality: The high morality related to comorbidities needs to be addressed through increased financing for treatment of comorbidities, and measures to encourage providers to implement the regulations of NTS 200. Increased financing and utilization of new drugs is important to reduce patient mortality. Increased training and supervision of health care workers will also assist in early identification of failure of treatment and signs of disease severity. It is important to improve the equipment and maintenance at the primary and secondary health care levels to assist in reducing mortality.

5. Conclusions

This study highlights the crucial role of incorporating the experiences and perspectives of managers in order to improve the performance of the national tuberculosis control program in Peru. The study used on-line questionnaires and face-to-face interviews to identify the main challenges to effective control of MDRTB in Peru, and recommendations to improve the operations and performance of the national program. The results underscore the need for effective financing to support the introduction of new drug schemes, establish point-of-care rapid molecular testing laboratories, expand mental health services, and assure effective continuity of care for patients. Furthermore, organizational changes, particularly the establishment of multidisciplinary teams, are essential to reduce problems in adherence to treatment, reduce treatment failure, and ultimately diminish TB mortality. Additionally, regulatory changes in private drugstore control and supervision are necessary to address self-medication practices.

Peru is confronting a crisis in the treatment of multi-drug resistant tuberculosis. International aid holds the potential for assisting the national problem to confront the many challenges identified by managers in this study, but is not currently doing so, in their opinion. This study recommends restructuring the collaboration between international aid agencies, civil society, and the Ministry of Health (MINSA in Peru to create an effective capacity to address the country's national TB crisis.

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