International Journal of Environmental Sciences
ISSN: 2229-7359
Vol. 11 No. 13s,2025
https://theaspd.com/index.php`

IMPROVING MDR TB OUTCOMES IN AFGHANISTAN: A QUANTITATIVE STUDY OF TREATMENT PRACTICES

Mohammad Taleb Noori[1]*, Amron Amron[2]
[1]MD, MPH, PhD Candidate in Management, Faculty of Economics and Business, Universitas Dian Nuswantoro, Indonesia
[2] Director of the Faculty of Economics and Business at Universitas Dian Nuswantoro, Semarang, Indonesia

Abstract Multidrug-resistant tuberculosis (MDR-TB) presents substantial healthcare challenges in Afghanistan, especially within resource-constrained settings. This study investigates treatment practices and systemic barriers while identifying actionable strategies to strengthen MDR-TB management and outcomes.

A quantitative research design was utilized, employing a structured survey distributed via Google Forms to 175 healthcare professionals actively involved in MDR-TB management. Participants included provincial TB coordinators, laboratory supervisors, DOTS nurses, NGOs' TB focal points, members of the National TB Control Program management team, and other healthcare providers from various regions, including underserved and conflict-affected areas. Data analysis leveraged statistical tools such as STATA and Microsoft Excel, applying descriptive and inferential techniques to uncover trends, disparities, and correlations.The findings highlight stark disparities in resource allocation, including irregular access to diagnostic tools, medications, and funding across healthcare facilities. Logistical delays and inefficiencies in supply chains further exacerbated these issues. Training programs for healthcare workers lacked consistency and adequacy, hindering their confidence and effectiveness in implementing WHO treatment guidelines. Patient dropout rates remained high, driven by financial challenges, transportation barriers, stigma, and adverse drug reactions. Public awareness campaigns showed moderate effectiveness but were unequally implemented, limiting their impact on stigma reduction and treatment adherence. Systemic barriers, such as workforce shortages, funding gaps, and inadequate policy implementation, were persistent challenges.This study underscores the importance of equitable resource distribution, sustainable capacity-building initiatives, culturally customized stigma reduction campaigns, and expanded community-based patient support programs. Strengthening collaborations between government entities and NGOs and integrating MDR-TB management into primary healthcare systems emerge as key recommendations for addressing systemic inefficiencies and improving healthcare outcomes. Future research should prioritize qualitative approaches to explore patient experiences and develop innovative strategies for enhancing treatment adherence and community engagement.

Keywords: Tuberculosis management, Drug-resistant tuberculosis, Patient adherence, Healthcare resources, Training and capacity building, Stigma in healthcare

INTRODUCTION

Tuberculosis (TB) remains a significant global public health challenge, particularly in low- and middle-income countries where healthcare systems are often strained by limited resources [1]. In Afghanistan, decades of conflict and instability have compounded this burden, creating substantial social, economic, and infrastructural barriers to effective TB management [2]. Among the most critical concerns is the growing threat of multidrug-resistant tuberculosis (MDR-TB), which undermines the effectiveness of first-line treatments and places considerable strain on the National TB Control Program [3].The rising incidence of MDR-TB in Afghanistan is driven by several interrelated factors, including inconsistent treatment adherence, insufficient healthcare resources, and delays in diagnosing drug-resistant cases [4], [5] Conflict-related disruptions exacerbate these challenges, restricting access to healthcare facilities and interrupting essential treatment regimens. Despite the introduction of global strategies such as Directly Observed Treatment and Short-course (DOTS), the success rate of TB treatment in the country remains inadequate to curb the escalating MDR-TB crisis [6].Healthcare professionals, including Provincial TB Coordinators, Provincial Laboratory Supervisors, DOTS nurses, NGOs' TB focal points, and members of the National TB Control Program, play pivotal roles in managing TB cases and improving outcomes World Health Organization [7]. However, their efforts are often hindered by resource shortages, inadequate training programs, and the pervasive stigma surrounding TB [8]; [9]. These challenges collectively undermine the effectiveness of MDR-TB interventions and highlight the urgent need for systemic improvements. Addressing stigma, a critical barrier to healthcare access, requires targeted interventions to improve awareness and community

engagement [10] This study aims to address these pressing challenges by investigating treatment practices and outcomes for MDR-TB through a comprehensive quantitative survey. Data collected directly from 175 healthcare stakeholders via Google Forms will provide actionable insights to strengthen Afghanistan TB control framework. By identifying gaps in resource allocation, training, and community engagement, the findings seek to inform strategies that enhance treatment efficacy, reduce MDR-TB cases, and improve overall patient outcomes across the country.

LITERATURE REVIEW

The management of multidrug-resistant tuberculosis (MDR-TB) remains a significant public health challenge in Afghanistan. The healthcare system, weakened by decades of conflict and instability, struggles to address the growing prevalence of MDR-TB amid substantial infrastructural and socio-economic barriers. This review synthesizes current research to examine the factors contributing to MDR-TB, explore mitigation strategies, and draw lessons from global approaches that could be adapted to the Afghan context.Afghanistan prolonged conflict has severely undermined its healthcare infrastructure, creating systemic challenges in MDR-TB management. [11] highlights the role of conflict in facilitating the evolution and spread of Mycobacterium tuberculosis. Displacement caused by armed violence exacerbates healthcare disruptions, limits access to essential services and impacts continuity of care. Moreover, the stigma associated with TB significantly hinders treatment adherence and care-seeking behaviors. [12] identify stigma as a critical barrier in Southern Afghanistan, emphasizing its pervasive impact on healthcare delivery. Despite efforts by Afghanistan National TB Control Program to integrate TB interventions into primary care, systemic gaps persist, including insufficient funding and inadequate training for healthcare workers [13]. The prevalence of MDR-TB in Afghanistan mirrors global trends, as [14] note in their analysis of high-burden regions. Key risk factors include treatment non-compliance, limited access to second-line drugs, and delays in diagnosing drug-resistant strains. Retrospective studies in Kandahar reveal that poor adherence to treatment guidelines and frequent interruptions significantly contribute to the rise in MDR-TB cases [3], [12]. [15] underscore the inadequate translation of WHO treatment guidelines into local practice, further exacerbating this issue. Socio-economic barriers, such as poverty and limited education, remain terrible obstacles, restricting patients access to timely and effective treatment.Global strategies like the Stop TB initiative have demonstrated success in certain regions but have seen inconsistent implementation in Afghanistan due to resource constraints and security challenges [16]. Promising approaches, such as short oral regimens for rifampicin-resistant TB, have shown higher retention rates and improved outcomes in Kandahar, particularly among pediatric patients [15]. Lessons from Pakistan management of adverse drug events during MDR-TB treatment highlight the importance of robust monitoring and supportive care systems [17]. Addressing treatment side effects has proven to be instrumental in improving patient adherence and overall outcomes. Globally, the World Health Organization (WHO) advocates for integrating socio-economic support mechanisms into TB control programs to address treatment barriers. [18] argue that financial and nutritional support significantly improve patient outcomes, especially in low-resource settings. Case studies from Somalia and Pakistan demonstrate that strengthening primary healthcare services and enhancing diagnostic capabilities lead to better outcomes. [19] document Somalia's successful integration of TB programs into primary care, while [13] highlight the importance of stakeholder coordination in improving retention rates and reducing MDR-TB cases. A systematic review by [14] underscores the need for context-specific interventions in high-burden regions, emphasizing the value of modifying strategies to Afghanistan unique socio-political and economic circumstances.Several studies have explored the knowledge, attitudes, and practices (KAP) of healthcare workers and patients in TB management. [20] and [21] reveal substantial gaps in awareness regarding the importance of treatment adherence and the risks associated with drug resistance. Such gaps underscore the need for targeted educational programs and awareness campaigns to reduce MDR-TB prevalence.The reviewed literature highlights several priorities for enhancing MDR-TB management in Afghanistan. First, training programs for healthcare workers must be improved to ensure effective implementation of treatment guidelines, as emphasized by [12]. Second, data-driven decision-making should be employed to monitor treatment gaps and assess program performance, as recommended by [14]. Third, socio-economic support systems, including financial and nutritional assistance, should be integrated into TB control programs to address patient-level barriers [18]. Finally, lessons from Somalia and Pakistan emphasize the value of scaling up primary healthcare services and fostering stronger stakeholder collaborations [19]; [17].In conclusion, the complexity of MDR-TB management in Afghanistan reflects the interplay of socio-economic, systemic, and clinical factors. While progress has been made, significant gaps remain,

particularly in resource allocation, training, and stigma reduction. By adopting innovative treatment regimens, enhancing healthcare worker training, and integrating socio-economic support systems, Afghanistan National TB Control Program can achieve better outcomes. Global experiences provide valuable guidance, but locally adapted solutions are essential for sustainable progress.

METHOD

This study employed a quantitative research design to investigate treatment practices and systemic barriers in the management of multidrug-resistant tuberculosis (MDR-TB) in Afghanistan. Recognizing geographic and infrastructural diversity across the country, a structured survey was chosen as the primary data collection tool to capture insights from healthcare professionals actively engaged in MDR-TB management. The survey was distributed via Google Forms, ensuring accessibility for respondents across various regions, including conflict-affected and underserved areas.A stratified random sampling method was utilized to ensure representation of diverse perspectives across professional roles and healthcare facility levels. The study sample consisted of 175 participants, including Provincial TB Coordinators, Provincial Laboratory Supervisors, DOTS nurses, NGOs' TB focal points, and members of the National TB Control Program Management team. These respondents play critical roles in implementing MDR-TB programs, aligning with the study emphasis on addressing frontline challenges.The survey included 23 structured questions covering demographics, resource allocation, training programs, patient care practices, stigma and awareness, and systemic challenges. Close-ended questions using a 5-point Likert scale, categorical options, and binary choices were employed to ensure clarity, consistency, and ease of analysis. Key themes explored included diagnostic tool availability, adequacy and frequency of MDR-TB training programs, barriers such as stigma and socio-economic factors, and systemic issues like logistical inefficiencies and policy gaps.Ethical considerations were rigorously maintained throughout the study. Participants provided informed consent electronically after reviewing a clear explanation of the study objectives, the voluntary nature of their involvement, and the confidentiality of their responses. Data was anonymized and securely stored to protect participant identities, reflecting the study commitment to ethical research practices.Data analysis was conducted using statistical tools such as STATA and Microsoft Excel. Descriptive statistics summarized response frequencies and distributions, providing a snapshot of current MDR-TB management practices and systemic barriers. Inferential statistics were employed to identify correlations and trends, enabling the study to uncover actionable insights aligned with its objectives. The findings not only highlight critical gaps in resource allocation, training, and patient support but also provide a foundation for practical recommendations to improve MDR-TB outcomes in Afghanistan.

RESULTS

Availability and Accessibility of Resources

The survey findings show stark disparities in resource availability across healthcare facilities managing MDR-TB. While 70.3% of respondents reported diagnostic tools like GeneXpert machines as "always available," 5.1% indicated these were "never available," posing significant challenges to delivering timely and effective care. Similarly, logistical delays emerged as a critical barrier, with 44.9% of participants acknowledging transportation and supply chain inefficiencies impacting medication availability. Funding inadequacies were another pressing issue: 60% of facilities described MDR-TB funding as "adequate," while the remaining facilities struggled significantly, with 11.4% rating it as "poor" and 2.3% as "very poor." Correlations identified between funding adequacy and diagnostic tool availability revealed that better-funded facilities were more likely to report consistent access to resources. These findings highlight the urgent need for equitable resource distribution and streamlined logistics to overcome systemic bottlenecks in MDR-TB management, particularly in underserved regions.

2. Training and Capacity Building

Training programs for MDR-TB management showed significant gaps in both frequency and quality. A concerning 63.4% of respondents had not received formal training within the past year, reflecting a lack of sustained capacity-building initiatives. Quality assessments further reinforced these concerns, with 50% of participants rating training programs as "excellent" or "good," while the remaining respondents described them as "average" (26.3%) or worse. Notably, 64.0% agreed that these programs equipped them with the necessary skills to implement WHO guidelines confidently. Inferential analysis revealed that facilities

with frequent training programs demonstrated better adherence to WHO guidelines, particularly in urban regions compared to rural areas, where training remains sporadic. These insights underscore the necessity for consistent, high-quality training programs, particularly in conflict-affected regions, where challenges are magnified. Addressing training gaps is critical for empowering healthcare workers and improving patient outcomes.

3. Adherence and Patient Care Practices

Patient adherence to MDR-TB treatment protocols remains a tough challenge. Financial difficulties ranked as the most significant barrier, cited by 61.1% of respondents, followed closely by transportation challenges (53.7%) and stigma-related issues (53.7%). Adverse drug reactions were also a notable contributor, accounting for 32.6% of dropout cases. Strategies such as community-based follow-ups and peer counseling programs have shown promise, but only 48.6% of facilities adopted the former, and even fewer (33.1%) utilized the latter. Correlation analysis revealed that facilities implementing community-based support programs experienced lower dropout rates, especially in provinces with established peer counseling networks. These findings emphasize the unused potential of community engagement and support mechanisms to address dropout concerns. Expanding targeted socio-economic interventions and scaling community-based programs could greatly enhance adherence rates and patient outcomes.

4. Stigma and Awareness

The persistent stigma surrounding MDR-TB emerged as a major obstacle to treatment-seeking behavior. Over 53.1% of respondents identified stigma as a "significant" or "very significant" preventive, with patients often delaying diagnosis or refusing treatment due to fear of judgment. While 44.0% of respondents rated public awareness campaigns as "very effective," implementation of these initiatives was inconsistent. Only 19.4% of participants reported frequent campaigns, limiting their overall impact. Trends in patient behavior revealed that regions engaging local community leaders in awareness efforts demonstrated improved adherence rates and earlier treatment-seeking behaviors. These findings stress the importance of expanding the reach and consistency of stigma reduction campaigns, custom-made to Afghanistan socio-cultural context, to foster more proactive healthcare behaviors.

5. Systemic and Policy Challenges

Systemic barriers, including workforce shortages (64.0%), funding gaps (56%), and limited diagnostic tools (48%), continue to delay effective MDR-TB management. Survey findings highlight broad support for integrating MDR-TB treatment into general primary healthcare systems, with 78.3% “agreeing” or “strongly agreeing”, that this approach could improve service accessibility and outcomes. Participants also emphasized the need for stronger collaborations between government entities and NGOs to bridge policy implementation gaps and enhance healthcare delivery. Correlation analysis indicated that workforce shortages are linked to lower treatment success rates, suggesting that addressing staffing gaps through sustained capacity-building initiatives could significantly improve patient outcomes.

6. Visual Enhancements

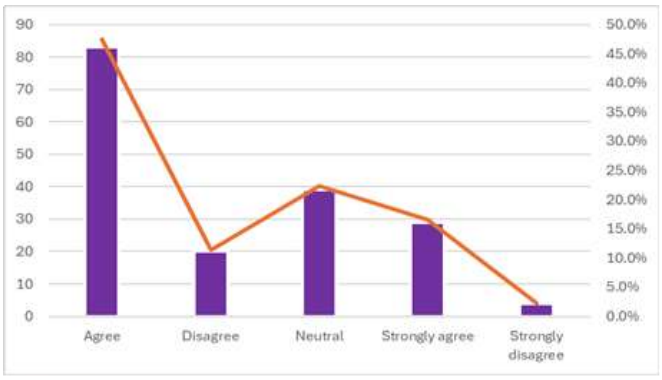

Fig 1: Illustrating varying levels of confidence among healthcare workers regarding the adequacy of MDR-TB training programs, highlighting gaps in capacity-building initiatives.

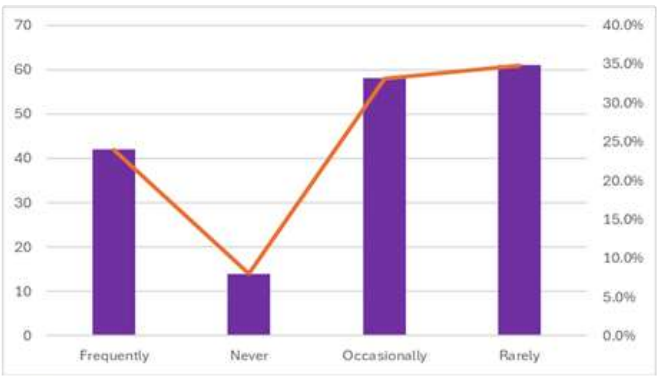

Fig 2: Comparing frequency of updates on MDR-TB treatment guidelines, showcasing discrepancies in communication across healthcare roles.

This section presents the survey findings using visual aids to enhance clarity and engagement. The visuals include bar graphs, pie charts, heat maps, and comparative tables, each designed to illustrate key trends and disparities from the 23 survey questions. By

integrating these visuals, the results are made more accessible, allowing for a deeper understanding of training adequacy, resource availability, systemic challenges, and strategies for improving MDR-TB management.

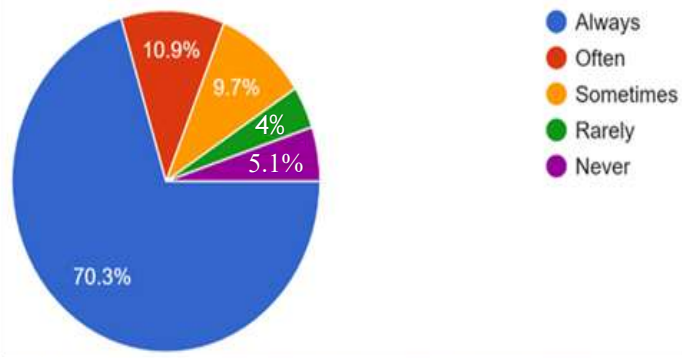

Fig 3: Visualizing the availability of essential diagnostic tools, emphasizing shortages in critical regions.

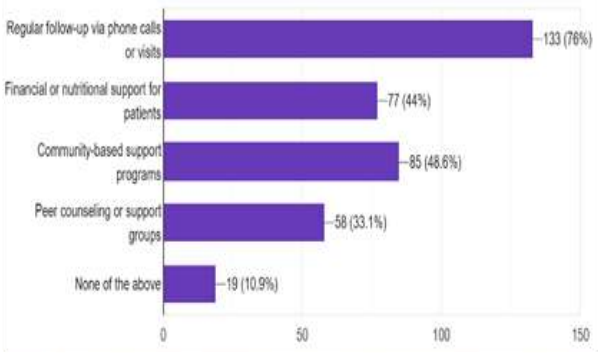

Fig 4: Providing insight into the adoption of patient adherence strategies, underscoring the importance of community-based approaches.

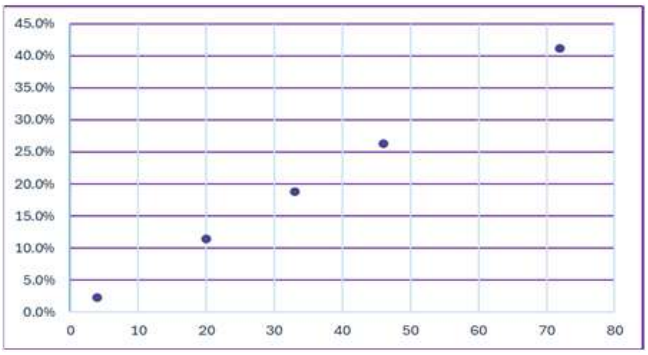

Fig 5: Depicting funding adequacy levels across different regions, highlighting disparities in financial support.

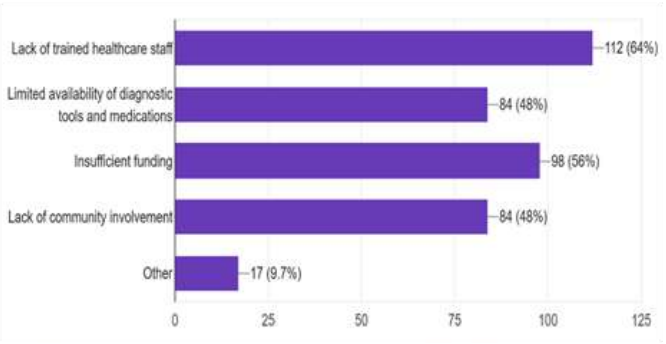

Fig 6: Mapping regional barriers to MDR-TB management, from workforce shortages to diagnostic tool unavailability.

Table 1: A Dual Lens on MDR-TB Management: Comparing Practices and Perspectives

Aspect	Monitoring MDR-TB Protocols (Q16)	Integrating MDR-TB Treatment (Q23)
High Agreement	77.1% (Always + Often)	78.3% (Strongly Agree + Agree)
Moderate Agreement	17.7% (Sometimes)	10.9% (Neutral)
Low Agreement	5.2% (Rarely + Never)	10.9% (Disagree + Strongly Disagree)

Source: Authors' Analysis (2025)

Table 1 highlights the findings from Q16 and Q23 of this study. It compares healthcare providers' practices in monitoring MDR-TB treatment adherence with their perspectives on integrating MDR-TB treatment into primary healthcare systems. Both questions reveal a strong consensus, with over 77% agreement on the importance of these approaches for improving patient outcomes. The results underscore the alignment in priorities and reinforce the need for consistent follow-up and systemic integration efforts.

DISCUSSION

This study provides valuable insights into the multifaceted challenges and opportunities for improving MDR-TB management in Afghanistan. The findings underscore the critical importance of addressing disparities in resource allocation, enhancing healthcare worker training, and expanding patient-centered interventions. These results align with and build upon existing literature while highlighting areas that require targeted efforts.

Restating Key Findings

The study revealed significant disparities in resource availability, with diagnostic tools and funding inconsistently distributed across healthcare facilities. Training programs for healthcare workers showed gaps in frequency and adequacy, leaving many professionals ill-equipped to implement WHO guidelines effectively. Patient adherence remains a major concern, driven by financial challenges, transportation barriers, and stigma, while systemic issues such as workforce shortages and policy implementation gaps continue to delay progress. These findings directly align with the study objectives of identifying actionable strategies to strengthen MDR-TB management frameworks.

Comparison with Previous Studies

The findings verify [11], who identified the impact of conflict-related disruptions on healthcare delivery and the spread of drug-resistant tuberculosis. Similarly, the challenges of stigma and treatment adherence echo the observations of [12], who emphasized stigma pervasive influence in Southern Afghanistan. While global strategies like the Stop TB initiative have been successfully documented in Pakistan and Somalia [19], this study underscores Afghanistan unique socio-political and economic barriers that limit their applicability. Lessons from Pakistan management of adverse drug events present practical models that could be personalized to Afghanistan context.

Implications

The results emphasize the need for equitable resource distribution, particularly to underserved regions, and sustained capacity-building initiatives to empower healthcare workers. Addressing financial and logistical barriers is vital to reducing dropout rates and enhancing patient adherence. The study advocates for scaling up community-based interventions, including financial assistance, peer counseling, and stigma reduction campaigns custom-made to Afghanistan socio-cultural context. Integrating MDR-TB management into primary healthcare systems could streamline service delivery and improve outcomes, provided strong collaborations between government entities and NGOs are established.

Limitations

Despite its strengths, this study has certain limitations that warrant acknowledgment. The reliance on survey data introduces the potential for response bias, as participants perspectives may be shaped by personal or organizational experiences. Additionally, geographic constraints may limit the generalizability of findings; remote and conflict-affected regions, where challenges are often more acute, remain underrepresented. Insights from these areas could provide contrasting perspectives and a more comprehensive understanding of MDR-TB management obstacles.

Future Research

Future research should explore qualitative approaches, such as in-depth interviews and focus groups, to capture patient experiences and socio-cultural dynamics influencing MDR-TB management. Investigating the long-term impact of innovative treatment regimens and community engagement strategies could uncover sustainable solutions. Expanding the scope to include underrepresented and remote regions will be essential to developing actionable, context-specific interventions adapted to Afghanistan unique healthcare challenges.

CONCLUSION

This study sheds light on the critical challenges and actionable strategies for improving MDR-TB management in Afghanistan. By thoroughly investigating treatment practices and systemic barriers, the findings contribute to a deeper understanding of key factors hindering effective healthcare delivery in resource-constrained settings.The study underscores the need for equitable resource distribution to address disparities in access to diagnostic tools, medications, and funding. Sustainable capacity-building initiatives are imperative to enhancing healthcare worker training and empowering professionals to confidently implement WHO treatment guidelines. Patient adherence to treatment protocols emerges as a pressing concern, influenced by socio-economic

barriers, stigma, and adverse drug reactions. Expanding community-based support programs, including financial and nutritional assistance, peer counseling, and follow-up visits, can play a pivotal role in mitigating these challenges.Culturally custom-made stigma reduction campaigns should be scaled up, engaging community leaders to foster early diagnosis and treatment adherence. On a systemic level, integrating MDR-TB management into primary healthcare systems offers a promising avenue to improve service accessibility and efficiency. This approach requires robust collaborations between government entities and NGOs, as well as policy reforms to address workforce shortages, strengthen healthcare infrastructure, and close implementation gaps.Despite its strengths, this study acknowledges certain limitations, including potential response bias and geographic constraints that may impact the generalizability of the findings. Future research should adopt qualitative methodologies, such as in-depth interviews and focus groups, to explore patient experiences and socio-cultural dynamics. Investigating the long-term impact of innovative treatment regimens and expanding studies to underrepresented regions will provide actionable, context-specific solutions.Through these multifaceted efforts, Afghanistan National TB Control Program can make significant progress in managing MDR-TB. Collaborative action driven by evidence-based policies and community engagement remains essential to achieving sustainable outcomes, ultimately contributing to a healthier and more resilient healthcare system.

Acknowledgements

I would like to extend my heartfelt gratitude to the dedicated team at Afghanistan National Tuberculosis Program (NTP) for their generous support throughout this research. Their invaluable assistance in distributing Google Form links to relevant professionals was instrumental in ensuring the timely collection of data via structured, close-ended questionnaires. I also wish to express my appreciation to other friends and colleagues who contributed to this process by facilitating communication and providing their insights.I would also like to extend my heartfelt appreciation to Prof. Dr. Yohan Wismantoro, Head of the Doctoral Program at the Faculty of Economics and Business, Universitas Dian Nuswantoro, Indonesia. His steadfast support in navigating challenges and alleviating academic stress has been invaluable in helping me sustain and progress smoothly throughout my educational journey.

Declaration Statements

Conflicts of Interest – There are no conflicts of interest to declare.

Ethics Approval – Ethical considerations were strictly adhered to throughout the research process. Data collection was conducted via Google Forms, ensuring the privacy, anonymity, and confidentiality of participants. Personal identifiers such as names, organization names, and specific areas of residence were omitted from the survey to protect participant privacy. Participation was entirely voluntary, with implied consent obtained through participants' decision to proceed with the survey. Participants were informed about this study purpose, procedures, and their rights, including the option to withdraw at any time. The data was securely stored using encryption and secure storage systems to prevent unauthorized access.

Funding Information – There was no funding provided for this research.

REFERENCES

[1] W. H. O. (WHO), "Tuberculosis remains major health challenge in Afghanistan, WHO says," WHO.

[2] D. Falzon et al., "Multidrug-resistant tuberculosis around the world: What progress has been made?," Eur. Respir. J., vol. 45, no. 1, pp. 150–160, 2015, doi: 10.1183/09031936.00101814.

[3] T. W. Wotale, M. E. Lelisho, B. W. Negasa, S. A. Tareke, W. E. Gobena, and E. G. Amesa, "Identifying risk factors for recurrent multidrug resistant tuberculosis based on patient's record data from 2016 to 2021: retrospective study," Sci. Rep., vol. 14, no. 1, p. 23912, 2024, doi: 10.1038/s41598-024-73209-x.

[4] U. A. for I. Development, "Multi-drug resistant tuberculosis: Assessing the U.S. response to an emerging global threat," Reliefweb.

[5] J. A. Caminero, J. A. Cayla, J. M. García-García, F. J. García-Pérez, J. J. Palacios, and J. Ruiz-Manzano, "Diagnosis and Treatment of Drug-Resistant Tuberculosis," Arch. Bronconeumol., vol. 53, no. 9, pp. 501–509, 2017, doi: 10.1016/j.arbr.2017.07.005.

[6] N. A. of Sciences., The New Profile of Drug-Resistant Tuberculosis in Russia: A Global and Local Perspective: Summary of a Joint Workshop. 2011.

[7] WHO, "Implementing The End TB Strategy," Antimicrob. Agents Chemother., vol. 58, no. 12, pp. 7250–7257, 2015, [Online]. Available:

https://www.cambridge.org/core/product/identifier/CBO9781107415324A009/type/book_part%0Ahttp://arxiv.org/abs/1011.1669%0Ahttp://dx.doi.org/10.1088/1751-8113/44/8/085201%0Ahttp://www.ncbi.nlm.nih.gov/pubmed/25246403%0Ahttp://www.pubmedcentral.nih.gov/artic

[8] Graban, "Laboratory Turnaround Time," no. October, 2016.

[9] A. Courtwright and A. N. Turner, "Tuberculosis and stigmatization: Pathways and interventions," Public Health Rep., vol. 125, no. SUPPL. 4, pp. 34–42, 2010, doi: 10.1177/00333549101250s407.

[10] M. Semrau et al., "Reducing stigma and improving access to care for people with mental health conditions in the community: protocol for a multi-site feasibility intervention study (Indigo-Local).," Res. Sq., pp. 1–21, 2023, doi: 10.21203/rs.3.rs-3237562/v1.

[11] V. Eldholm et al., "Armed conflict and population displacement as drivers of the evolution and dispersal of Mycobacterium tuberculosis," Proc. Natl. Acad. Sci. U. S. A., vol. 113, no. 48, pp. 13881–13886, 2016, doi: 10.1073/pnas.1611283113.

[12] M. H. Stanikzai, N. Rahimy, A. H. Baray, Z. Anwary, M. Ahmad, and H. Sayam, "High stigma prevalence and associated factors among TB patients in Southern Afghanistan: A multi-center cross-sectional study," Indian J. Tuberc., vol. 71, no. S2, pp. S203–S207, 2024, doi: 10.1016/j.ijtb.2024.08.005.

[13] K. Seddiq, D. A. Enarson, K. Shah, Z. Haq, and W. M. Khan, "Implementing a successful tuberculosis programme within primary care services in a conflict area using the stop TB strategy: Afghanistan case study," Confl. Health, vol. 8, no. 1, pp. 1–9, 2014, doi: 10.1186/1752-1505-8-3.

[14] N. Salari, A. H. Kanjoori, A. Hosseinian-Far, R. Hasheminezhad, K. Mansouri, and M. Mohammadi, "Global prevalence of drug-resistant tuberculosis: a systematic review and meta-analysis," Infect. Dis. Poverty, vol. 12, no. 1, pp. 1–12, 2023, doi: 10.1186/s40249-023-01107-x.

[15] A. Mesic, "Drug resistant tuberculosis in Afghanistan: We must continue to put people at the centre of treatment," BMJ, vol. 376, no. January, 2022, doi: 10.1136/bmj.o46.

[16] A. Mesic et al., "Translating drug resistant tuberculosis treatment guidelines to reality in war-torn Kandahar, Afghanistan: A retrospective cohort study," PLoS One, vol. 15, no. 8 August 2020, pp. 1–17, 2020, doi: 10.1371/journal.pone.0237787.

[17] F. U. Khan et al., "Assessment of Adverse Drug Events, Their Risk Factors, and Management Among Patients Treated for Multidrug-Resistant TB: A Prospective Cohort Study From Pakistan," Front. Pharmacol., vol. 13, no. May, pp. 1–10, 2022, doi: 10.3389/fphar.2022.876955.

[18] M. R. L. Ferreira et al., "Social protection as a right of people affected by tuberculosis: a scoping review and conceptual framework," Infect. Dis. Poverty, vol. 12, no. 1, pp. 1–17, 2023, doi: 10.1186/s40249-023-01157-1.

[19] I. Sindani et al., "Multidrug- Resistant," vol. 19, no. 3, pp. 2010–2011, 2013.

[20] M. Y. Essar et al., "Knowledge, Attitude, and Practices Toward Tuberculosis Among Hospital Outpatients in Kabul, Afghanistan," Front. Public Heal., vol. 10, no. July, 2022, doi: 10.3389/fpubh.2022.933005.

[21] N. Alimi and R. Sakhi, "Knowledge, Attitude, and Practices Toward Tuberculosis Among Health Faculty and Non-Health Faculty Students of Kabul University and Kabul University of Medical Sciences, Kabul, Afghanistan," Adv. Med. Educ. Pract., vol. 14, pp. 753–761, 2023, doi: 10.2147/AMEP.S411323.