Article

Letter to the editors

Can one health achieve the target of end TB strategy: perspective from zoonotic TB prevention and control in India

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The World Organization for Animal Health (WOAH) has recognized that not only Mycobacterium tuberculosis but a number of other organisms from the M. tuberculosis complex (MTBC) are present in animals and the environment; can cause zoonotic TB (zTB) [1]. Increasing vicinity between species causes a spike in the interspecies transmission of infectious pathogens and drug-resistant mycobacteria. The treatment of humans with zTB is difficult, as zTB is resistant to first-line anti-tuberculosis drugs [2]. India has the highest share of human tuberculosis globally, with more than 2.6 million cases and 400,000 deaths reported in 2019. Cattle population in India was more than 300 million in 2017, of which 7% were estimated to be infected with TB. zTB costs $3 billion economic loss annually [3]. As the health of all species (humans, animals, and the environment) are interconnected, TB elimination efforts require an integrated One Health (OH) approach [4]. India´s National Tuberculosis Elimination Program (NTEP) aims to eliminate TB by 2025, five years ahead of the global targets [5]. This requires understanding the multifaceted causes and risks of TB. As there is limited research on animal TB and its interaction with humans and the importance of zTB is not well vitalized in the NTEP, this synthesis folds favorable OH strategy for TB elimination, indicating missing components.

The major OH strategies synthesized from the global literature review

Multi-sectoral engagement: engagement of human health, animal health and food safety sectors need to be sensitized to address the role of animals in the transmission of M.bovis as zTB cannot be controlled by the silo approach [4].

Advocating for awareness: conducting awareness sessions and motivational training in the general community, especially for cattle handlers; focusing on zTB transmission, general hygiene and handling

methods of infected animals would minimize the exposure to humans [6].

One health surveillance: the inter-collaborative programs along with integrated surveillance for zTB should be initiated based on OH aspects. Data sharing, integrated data collection and/or compilation and strategic discussions between departments with systematic collaboration is a crucial step to establishing a robust OH surveillance [7].

Investigation of the burden of zTB: the large-scale OH prevalence studies on understanding the burden of zTB is highly recommended, which will assist in identifying the high-risk vulnerable population, where the active human case findings could be strengthened for case detection [8].

Community-tailored integrated interventions: the cross-sectoral and community-tailored interventions across the program implementation framework, which can address both human and animal health together, are recommended [8].

Expanding diagnostic and treatment algorithms: TB implementation framework was widely focused on different types of human TB infractions and diseases; case findings strategies, public health actions, and diagnostic and treatment algorithms that include zTB will expand further and provide one step toward TB elimination [9].

Revisiting the standards: there should be an improvement in the standards of food safety and control of zTB in the animal reservoir, including assessment of food hygiene practices, slaughterhouses, and animal screening before reaching the slaughterhouse [10].

Recommended OH strategies to strengthen the NTEP in India

Distinct classification of zTB: the prevalent method of human TB diagnosis by sputum smear examination or some rapid assays could not

differentiate the causative species; hence, zTB can be misclassified.

Develop the capacity of laboratory structure for testing of zTB: it could be diagnosed by PCR and gene sequencing of culture isolates. Also, it requires careful sample collection, but the facilities equipped with the required infrastructure to culture isolates are inadequate (Figure 1).

Advance one health surveillance: the integration of animal TB and human TB surveillance systems is missing in the NTEP. Currently, no such strategies emphasize the cross-sectoral communication of collected data sharing or prediction of hotspots. The Nikshay, a web-based national TB surveillance system, should have data entry points based on zTB surveillance data.

Avoid treatment delay: current diagnostic infrastructure and treatment algorithms are more structured and inclined for human pulmonary TB, while zTB in humans is mainly associated with extra-pulmonary TB, which may delay diagnosis and eventually delay treatment initiation.

Adequate treatment for zTB patients: most TB treatment starts without identifying the causative organism and drug susceptibility test, and bTB patients are naturally resistant to pyrazinamide, a standard first-line anti-TB treatment regimen. In this case, patients may get inadequate treatment regimens.

One health epidemiological study for the true prevalence of zTB: the true incidence is likely underestimated due to poor disease surveillance systems and poorly monitored programs, especially in LMICs where the most vulnerable populations reside. Along with domestic animals, bovine TB control programs should also be applied to wild animals because they can be important reservoirs.

Minimize higher lethality of zTB patients: patients infected with M. Bovis tend to have higher lethality than those infected with M. tuberculosis.

Public health actions of the NTEP should be emphasized for vulnerable populations.

Conclusion

A one health approach is clearly needed in the tuberculosis elimination program, as the disease has serious consequences for humans and most animal species. Scientific advances to meet the need for global tuberculosis control in all host populations are urgently needed, but this will require tailor-made, context-specific new thinking regarding the ecology of tuberculosis and an integrated practical application of the one health concept.

Competing interests

The authors declare no competing interests.

Authors´ contributions

Conceptualization: SY, FM, DS; data extraction: SY, FM; formal analysis: SY, FM, HS; writing original draft: FM; Writing, review and editing: SY, FM, HS, DS. All the authors have read and agreed to the final manuscript.

Figure

Figure 1: one health missing Link in the National Tuberculosis Elimination Program (NTEP) program

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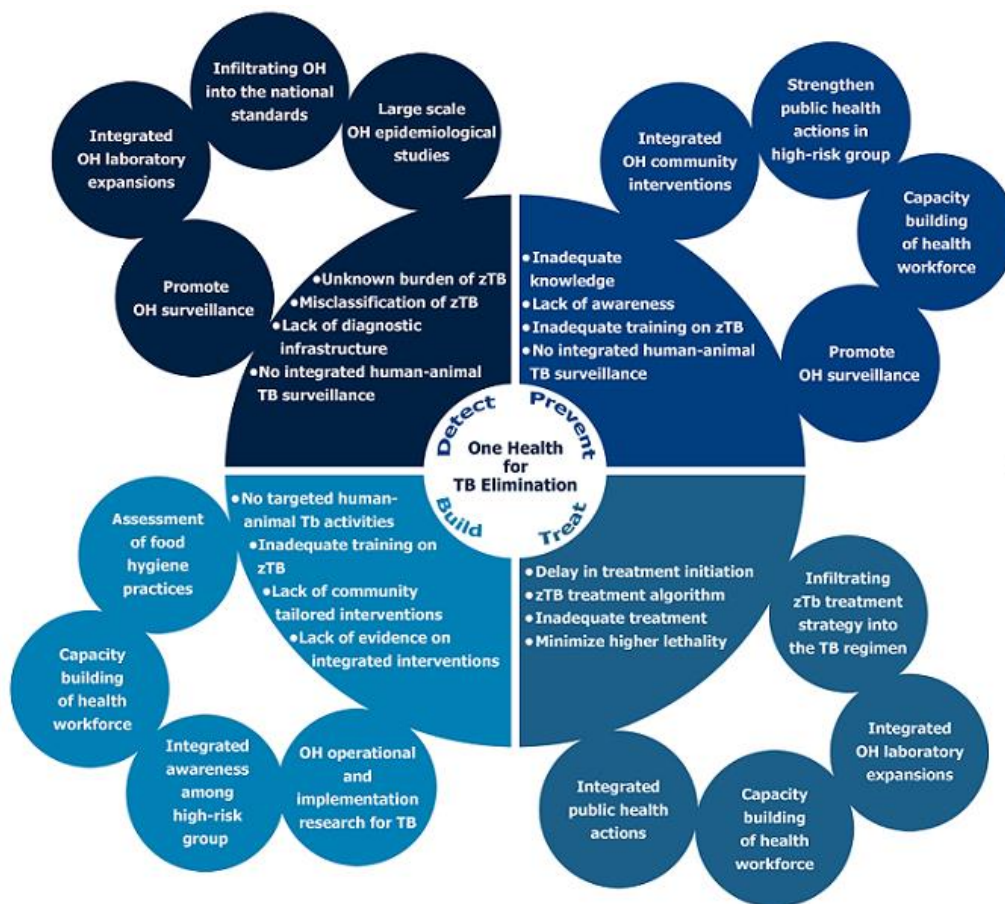
Figure 1: one health missing Link in the National Tuberculosis Elimination Program (NTEP) program