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Mycobacterial Diseases

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Perspective

Human Networks as Pathways for Tuberculosis Infection

Boihat Corijo*

Department of Infectious Diseases, University of Georgia, Athens, Georgia, USA

DESCRIPTION

Despite advancements in medical research and global Tuberculosis (TB) control programs, the disease remains prevalent in many communities. One significant but often overlooked factor contributing to the spread of TB is exposure through social networks. Understanding how these networks facilitate transmission can provide insights into prevention strategies and enhance targeted intervention efforts. Social networks encompass the web of relationships and interactions individuals maintain with family, friends, co-workers, and community members. These connections, while essential for social and emotional well-being, can inadvertently become pathways for the spread of infectious diseases like TB. Close and prolonged contact with an infected individual, particularly in confined or poorly ventilated spaces, significantly increases the risk of transmission. Research indicates that the transmission of *M. tuberculosis* is not random but often clustered within social groups. These groups may include households, workplaces, schools, or community gatherings. The dynamics of social networks influence the patterns of exposure, with certain individuals, often termed super spreaders, playing a pivotal role in disseminating the infection to multiple contacts.

Factors of exposure in social networks

Overcrowded housing and shared living spaces are common in many low-income communities, creating an ideal environment for the spread of *M. tuberculosis*. Extended contact with household members increases the likelihood of exposure, especially if one member is an active TB case. Certain occupational settings, such as healthcare facilities, prisons, or factories, pose a higher risk due to prolonged close contact among individuals. Workers in these environments often have limited access to preventive measures like ventilation or respiratory masks. Cultural gatherings, festivals, or rituals involving large groups in confined spaces may facilitate the spread of TB. In some cultures, stigma surrounding TB discourages infected individuals from seeking timely medical care, increasing the risk of unknowingly transmitting the infection. Limited access to healthcare services in underserved areas leads to delayed detection and treatment of TB, prolonging the infectious period. Infected individuals may unknowingly expose their social networks before being diagnosed. To effectively curb TB transmission, it is crucial to identify high-risk social networks. Contact tracing, a well-established public health tool, plays a vital role in this effort. By mapping the interactions of TB patients, healthcare professionals can identify and screen individuals who are most at risk. Molecular epidemiology, which involves analysing the genetic material of *M. tuberculosis* strains, also helps determine links between cases within a network. Key populations to focus on include, household members of active TB patients. Individuals in frequent contact with vulnerable populations, such as the elderly or immunocompromised. Communities with high levels of poverty, overcrowding, or limited access to healthcare.

Prevention strategies targeting social networks

Educating communities about TB transmission, symptoms, and the importance of early diagnosis can reduce stigma and encourage individuals to seek timely care. Investing in better housing, ventilation, and sanitation can mitigate the risk of TB transmission in overcrowded settings. Conducting regular screenings in high-risk groups ensures early detection and treatment, minimizing exposure within social networks. Expanding access to healthcare services, particularly in rural and low-income areas, helps reduce delays in diagnosis and treatment. Providing prophylactic treatment to individuals exposed to active TB cases can prevent latent infections from progressing to active disease. Strengthening vaccination programs, such as the Bacillus Calmette-Guérin (BCG) vaccine, can provide protection against severe forms of tuberculosis in children. Ensuring adequate supply and accessibility of essential TB medications can improve treatment adherence and reduce drug resistance. Community-based support programs can aid patients in completing their treatment regimens, reducing the risk of relapse. Enhancing public health surveillance systems enables early identification of outbreaks and targeted interventions. Collaborative efforts between governments, NGOs, and local communities are crucial for sustained progress in TB prevention and control.

Correspondence to: Boihat Corijo, Department of Infectious Diseases, University of Georgia, Athens, Georgia, USA, E-mail: corihat.b@gmail.com

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CONCLUSION

M. *tuberculosis* infection attributable to exposure in social networks underscores the importance of understanding human interactions and their role in disease transmission. By addressing the social and environmental factors that facilitate the spread of TB, public health initiatives can implement more effective prevention and control strategies. Prioritizing early detection, raising awareness, and improving living and working conditions are vital steps toward breaking the cycle of transmission and reducing the global burden of tuberculosis.