Short Communication

Doxycycline- A new tool in the armamentarium against the oldest known infection to mankind

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The developing world is having a number of issues related to healthcare.¹ The situation in some of these countries is so grave that the population at large is lacking access to basic healthcare facilities.² The diseases that have been commonly responsible for such situations are tuberculosis (TB), HIV, malaria, etc.³ TB is a public health problem.⁴ The disease is known to mankind for a long time and the first reports of this bacterial infection date to three million years ago.⁵ Globally the disease causes large-scale morbidity and mortality.⁴ The WHO global report of the year 2020 estimated that ten million people developed active TB disease in 2019, with 1.4 million mortalities.⁶ The highest burden lying in WHO regions of South-East Asia, Africa, and the Western Pacific.⁶

The disease as detailed in the medical literature is a contagious, infectious disease, due to the bacterium Mycobacterium tuberculosis and has always been a major challenge over the course of human history, due to its severe social implications.⁵ The management of TB involves the use of drugs that are associated with multiple adverse effects and the treatment regimen is usually six months.⁷ The high pill burden, adverse drug reaction, social stigma, etc. are some of the common issues associated with TB management.⁸ The development and inclusion of newer drugs like Bedaquiline, Pretomanid, and Delamanid have given a ray of hope for the national TB elimination programs to end TB by 2030.⁹,¹⁰ However, with the development of mutations leading to resistance in the bacteria and poor tolerance of these drugs added up by dismal patient compliance and psychosocial support, the goal of ending TB by 2030 looks like a distant dream.

Recently reports of a common antibiotic Doxycycline being proposed in the management of TB have come.¹¹ In this research on 210 TB patients, it was found that there were higher levels of enzymes called matrix metalloproteinases (MMPs).¹¹ It’s known that most infectious TB patients had very high MMP levels.¹² These high MMP levels ultimately caused severe lung damage.¹² As these MMP digest the collagen, a major structural protein in the body that is responsible for maintaining the lung structure.¹² Further, based on studies on human cell and animal models they proposed that the use of Doxycycline in these patients who were given the drug along with the standard TB regimen could have less lung damage as the levels of MMP might be less due to the inhibitory action of the Doxycycline on the MMP enzymes.¹¹ The loss of collagen leads to the development of lung cavities, which harbors the bacteria and common anti-TB drugs do not fully reach these cavities thereby resulting in poorer outcomes.¹³ The latest findings could be a boon to the researchers working towards a better and more effective anti-TB treatment. However, as mentioned earlier the study lacks complete clinical trials and until the same is achieved
we could only hope for a more effective anti-TB treatment. The use of host-directed adjunctive therapies which could help modulate the host immune response to make the anti-TB drugs more effective is the need of the hour and the latest reports of Doxycycline, a tetracycline antibiotic, being one of such drug has raised hopes. Doxycycline is a cheap, safe, and widely available drug throughout the developing world, and thus could be a potential new drug in the management of TB especially in underprivileged countries.

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2. Conflict of Interest
None.

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References
1. Chudi IP. Healthcare problems in developing countries. Med Pract Rev. 2010;1(1):9–11.
2. World Bank and WHO: Half the world lacks access to essential health services, 100 million still pushed into extreme poverty because of health expenses. Available from URL:- https://www.who.int/news/item/13-12-2017-world-bank-and-who-half-the-world-lacks-access-to-essential-health-services-100-million-still-pushed-into-extreme-poverty-because-of-health-expenses. Last accessed 2021 on May 1.
3. Bloom BR, Atun R, Cohen T, Dye C, Fraser H, Gomez GB, et al. Tuberculosis. In: Holmes KK, Bertozzi S, Bloom BR, et al., editors. Major Infectious Diseases. 3rd edition. Washington (DC): The International Bank for Re却struction and Development / The World Bank; 2017 Nov 3. Chapter 11. Available from URL:- https://www.ncbi.nlm.nih.gov/books/NBK525174/. Last accessed 2021 on May 1.
4. Yadav S, Rawal G. The organizational challenges in the management of the revised national tuberculosis control program of India: an overview. Pan Afr Med J. 2020;36:213.
5. Barberis I, Bragazzi NL, Galtuzzo L, Martini M. The history of tuberculosis: from the first historical records to the isolation of Koch’s bacillus. J Prev Med Hyg. 2017;58(1):E9-E12.
6. WHO. Global tuberculosis report 2020. https://apps.who.int/iris/bitstream/handle/10665/336069/9789240013131-eng.pdf. Last accessed 2021 on May 1.
7. Implementing the WHO Stop TB Strategy: A Handbook for National Tuberculosis Control Programmes. Geneva: World Health Organization; 2008. 2. Treatment of tuberculosis patients. Available from URL: https://www.ncbi.nlm.nih.gov/books/NBK310759/. Last accessed 2021 on May 1.
8. Gebremariam MK, Bjune GA, Frich JC. Barriers and facilitators of adherence to TB treatment in patients on concomitant TB and HIV treatment: a qualitative study. BMC Public Health. 2010;10:651.
9. New TB drugs - Bedaquiline, Delamanid & more. Available from URL: https://tbfacts.org/new-tb-drugs/. Last accessed 2021 on May 1.
10. The END TB strategy. Available from URL: https://www.who.int/tb/End_TB_brochure.pdf. Last accessed 2021 on May 1.
11. Readily available antibiotic could help to curb lung damage from TB. Available from URL: https://www.tbonline.info/posts/2017/5/23/readily-available-antibiotic-could-help-curb-lung-damage. Last accessed 2021 on May 1.
12. Walker NF, Wilkinson KA, Meintjes G, Tezera LB, Goliath R, Pepfer JM, et al. Matrix Degradation in Human Immunodeficiency Virus Type 1–Associated Tuberculosis and Tuberculosis Immune Reconstitution Inflammatory Syndrome: A Prospective Observational Study, Clinical Infectious Diseases. 2017;65(1)121–32.
13. Combination of doxycycline and TB drug treatment reduces the size of lung cavities. Available from URL: https://www.news-medical.net/news/20210621/Combination-of-doxycycline-and-TB-drug-treatment-reduces-the-size-of-lung-cavities.aspx. Last accessed 2021 on May 1.

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