Eradication of Tuberculosis– Current Status and the Way Forward

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Abstract

It is estimated that about 25% of humanity is infected with the bacterium Mycobacterium tuberculosis. That is about 2 billion people. Several new vaccines will pass Phase I clinical trials in the next few years. This paper briefly summarizes past and present challenges to developing a vaccine against tuberculosis as well as treating tuberculosis. TB is a pathogen that infects more individuals globally than any other communicable disease. TB is particularly devastating in poor developing countries, notably in Africa and Southeast Asia. Despite the WHO's efforts to overcome TB, Multi Drug Resistant (MDR) TB and Extremely Drug Resistant (XDR) TB are huge challenges.

Keywords: *TB, MDR TB, XDR TB, Tuberculosis, Multidrug Resistant Tuberculosis, Extremely Drug resistant tuberculosis, TB vaccine, TB eradication, Millennium Development Goals, MDGs.*

Introduction

Global efforts are being made to eradicate tuberculosis (TB) as a public health problem by 2030. TB treatment can cause psychiatric disorders. The occurrence, prevalence and mortality rate of TB varies between countries and the paucity of accurate data makes an accurate assessment even more challenging. The psychological interactions are most common in the advanced stages of disease management and in patients with BMI ≤ 18. This necessitates continuous monitoring throughout the management.[1] Antimicrobial resistance (AMR) is a leading cause of mortality worldwide.

Bacteria mutate faster than we can develop new antibiotics. Vaccination with BCG reduces mortality rates.[2] BCG co-administered with DPT also reduces mortality rates.[3] The evidence is overwhelming that BCG vaccines are cost compatible one and help in reducing mortality.[4] These vaccines act as immunity enhancers and appropriate selection of drug transporters may produce a better result. Macrophages play a vital role in the development of TB granulomas and the infection process. Cell-mediated immunity actsagainst Mycobacterium. Macrophages areimmune cells that act as a first-line defence against Mycobacterium infection.[5,6]

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Mycobacterium tuberculosis is capable of producing disease in any part of the human body including lungs and bone. TB acts differently on different organs, eg spine and lungs. Therefore, the management also varies. The need of the hour is for personalized TB management.[7,8] When certain cautiously and carefully chosen medicines are given together in the right proportions, we might get synergistic bactericidal actions that kill the extremely resistant bacteria. Combination therapy is used to treat tuberculosis. Research reveals that poverty and co-infection with human immunodeficiency virus and non-communicable diseases such as cancer and candidiasis are challenges to overcome the disease.[9,10] Synergistic combination treatments can be developed cheaply, used in patients safely since the constituent drugs are well known and thus could potentially be widely distributed.

WHO global TB statistics: The Millennium Development Goals (MDGs) aim for a TB free world by 2050. The WHO report on global TB 2019 says around 3.4% TB cases were MDR TB or Rifampin resistance (RR) TB. This was for the year 2018. 3 countries account for half of the world's MDR burden. India accounts for 27% of the burden. China accounts for 14% and the Russia Federation for 9%.[11]

Various factors influence human health: human behavior, lifestyle modification, socioeconomic factors,political scenario, transcultural issues and genetic factors. All of them have varying levels of significance.[12]In the eradication of TB,the government must take the help of private clinicians and NGOs. Effective cooperation between the public and private sectors can drive synergies in the TB control program.

Oto toxicity, renal toxicity and hepatotoxicity can be caused by a lengthy duration of intake of medication. Toxicity and unaffordability have been identified as causes of poor outcomes.[13] In the early twentieth century, socio economic changes led to a decline in TB morbidity and mortality in Western Europe and Northern America.[14,15]

Discussion

Current advances in Nano medicine have seen significant strategic developments in both experimental and clinical research. These successes have been made possible because of the continuous synchronization and collaboration of different disciplines: inter-professional practice (IPP). The current focus is on reducing the rate of occurrence of TB through increasing education and awareness efforts. One approach that has not been tested is the benefits of the use of more nutritious antioxidant food in the diets of TB patients. Extensive clinical trials in animals are required. Priya Rathiet al in their research on "Patient treatment pathways of multi drug-resistant tuberculosis cases in coastal South India: Road to a drug-resistant tuberculosis center " stress that the health-seeking activities of a patient are totally influenced bythe awareness of the infection, the severity of symptoms or stage of the diseases and availability of social support, especially in the form of rehabilitation. As famous futurist Michio Kaku, quantum physicist Dr Amit Goswami and the Mahe former Vice-chancellor BM Hegde say: Precision in global health can be brought about by improved artificial intelligence and an incorporation of the concepts of quantum physics through holistic or integrated approaches which combine Genetics, Medical sociology and data sciences.

Conclusion

TB remains a major challenge in global health, despite the emergence of new infectious diseases like Nipah, H1N1,Corona etc. It means significantly effective as well as safer vaccines are required to rein in this epidemic. Effective interventions on a significant scale are especially required in TB-HIV and TB–Candidiasis co-infections. Even though the 2014 WHO report says that the mortality rate due to communicable diseases has decreased significantly, research on anti TB treatment must not cease. This, in spite of unsatisfactory, substandard, poor outcomes from various experimental and clinical trials. It is imperative on the global medical research community to find a safe and efficacious vaccine.

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