The role of genetics in tuberculosis susceptibility and treatment response.

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Introduction

Tuberculosis (TB) is a contagious bacterial infection that mainly affects the lungs, but can also affect other parts of the body such as the brain, kidneys, and bones. TB is caused by a bacterium called Mycobacterium tuberculosis, which is transmitted from person to person through the air when an infected person coughs or sneezes. TB is one of the oldest and deadliest diseases known to mankind, and has been a major public health problem throughout history. The earliest evidence of TB dates back to around 4000 BCE in Egypt, where mummified bodies show signs of TB infection. TB has also been found in the bones of ancient Greek and Roman civilizations. However, TB became more widespread and deadly during the Industrial Revolution in Europe and North America, as crowded and unsanitary living conditions facilitated the spread of the disease. In the 19th century, TB was known as "consumption" due to its wasting effects on the body [1].

At the time, TB was the leading cause of death in Europe and the United States, and had a significant impact on art and literature, with many romanticizing the disease as a symbol of beauty and suffering. However, with the advent of germ theory and modern medicine, the understanding of TB improved, leading to the development of effective antibiotics in the 20th century, such as streptomycin, isoniazid, and rifampin. Despite these advances, TB remains a major public health problem worldwide, particularly in low- and middle-income countries where access to healthcare and resources is limited. According to the World Health Organization (WHO), TB is one of the top 10 causes of death worldwide, with an estimated 10 million cases and 1.4 million deaths reported in 2019. TB is also a leading cause of death among people living with HIV/AIDS, as the two diseases are closely linked. Today, TB is a major focus of global health initiatives, with efforts to improve TB diagnosis, treatment, and prevention. These efforts include the development of new TB drugs and vaccines, the expansion of TB diagnostic and treatment services, and the implementation of public health policies and programs to control the spread of TB [2].

Tuberculosis (TB) remains a major global public health problem, causing significant morbidity and mortality worldwide. According to the World Health Organization (WHO), TB is one of the top 10 causes of death worldwide, and the leading cause of death from a single infectious agent, surpassing HIV/AIDS. In 2019, there were an estimated 10 million cases of TB worldwide, and 1.4 million deaths due to TB, with the majority of cases occurring in low- and middle-income countries. The impact of TB on public health is multifaceted and complex. TB is not only a medical problem but also a social and economic one, as it disproportionately affects marginalized and vulnerable populations, including people living with HIV/AIDS, prisoners, migrants, and refugees. The burden of TB is also influenced by various social determinants of health, such as poverty, malnutrition, overcrowding, and limited access to healthcare [3].

TB can have a devastating impact on individuals, families, and communities, causing illness, disability, and death. TB can also lead to significant economic losses, including lost productivity, treatment costs, and long-term disability. TB has been estimated to cause a global economic loss of US$ 3 trillion by 2030 if current trends persist. In addition to its direct impact on health and well-being, TB also contributes to the spread of drug-resistant strains of TB, which are more difficult and expensive to treat. The emergence of drug-resistant TB poses a significant threat to global health security, as it undermines the effectiveness of current TB control programs and requires innovative approaches to diagnosis, treatment, and prevention. To address the global burden of TB, the WHO has set ambitious targets for TB control and elimination, including reducing TB incidence by 90% and TB deaths by 95% by 2035. Achieving these targets will require a comprehensive and sustained effort from governments, international organizations, civil society, and the private sector, to ensure that all people affected by TB have access to high-quality and affordable TB diagnosis, treatment, and care, and to address the social determinants of health that contribute to TB transmission and progression [4].

Tuberculosis (TB) is a global public health problem that affects people in all regions of the world, but the burden of the disease is not evenly distributed. According to the World Health Organization (WHO), more than 95% of TB cases and deaths occur in low- and middle-income countries, particularly in Africa, Asia, and the Western Pacific regions. The highest burden of TB is seen in countries with high rates of poverty, malnutrition, and overcrowding, as well as limited access to healthcare. TB is closely associated with various social determinants of health, which are the conditions in which people are born, grow, live, work, and age, and which influence

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their health outcomes. Social determinants of health that are linked to TB include poverty, malnutrition, overcrowding, and limited access to healthcare, education, and social services. Poverty is a major risk factor for TB, as it is often associated with malnutrition, which weakens the immune system and makes individuals more susceptible to TB infection. Poverty is also associated with overcrowding, which increases the risk of TB transmission, particularly in urban slums and informal settlements. In addition, poverty often leads to limited access to healthcare, including TB diagnosis and treatment services, which can result in delayed diagnosis, treatment failure, and the development of drug-resistant TB [5].

Conclusion

Other social determinants of health that are associated with TB include migration and displacement, which can increase the risk of TB transmission and access to healthcare, particularly among refugees and asylum seekers. TB is also associated with stigmatization and discrimination, particularly against marginalized and vulnerable populations, such as people living with HIV/AIDS, prisoners, and people who use drugs. To address the social determinants of health that contribute to the global burden of TB, a comprehensive and multidisciplinary approach is needed, which includes not only medical interventions, but also social and economic interventions. This includes improving access to healthcare, education, and social services, addressing poverty and inequality, and promoting social inclusion and human rights. Such efforts can help to reduce the burden of TB and improve the health and well-being of individuals and communities affected by this disease.

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