Editorial

Tuberculosis in Singapore: Past and Future

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Tuberculosis—a curable and largely preventable disease—remains one of the top 10 global causes of death today. In 2017, the World Health Organization estimated that 23% of the world population had latent tuberculosis and 10 million people had developed active tuberculosis, of which just under half a million were new cases of multidrug-resistant tuberculosis that accounted for approximately 1.6 million deaths.[1]

In a historic high-level meeting held at the United Nations General Assembly on 26 September 2018, world leaders unanimously endorsed a political declaration that—among a host of other public health, clinical, research and financing actions—reaffirmed the resolve to end the global tuberculosis epidemic by 2030 and committed to treat 40 million people with tuberculosis by 2022.[2] Their actions particularly highlighted that tuberculosis is not just a medical disease, but it is also one with considerable historical, political and socioeconomic dimensions.[2]

History provides important lessons on the combined roles played by government and community in tuberculosis control in Singapore. The late prime minister, Lee Kuan Yew, used the disease as a metaphor for nation-building after the People's Action Party led by him registered a decisive victory in the 1963 general elections: "Unite the people, build a prosperous and an equal society, isolate the Communists, contain them, like the tuberculosis bacilli is contained, where you throw a hard crust around an infected wound and keep your patient healthy and he would live a good life".[3] After the Second World War, successive governments and the community made robust efforts to combat tuberculosis which substantially shaped the nation state and its society across the colonial and postcolonial periods.

The pivotal years of tuberculosis control in Singapore were in the 3 decades that followed the end of the Second World War when the disease rates declined sharply following a series of defining environmental, housing and medical reforms. These included compulsory notification, creation of a central registry of cases and comprehensive case-finding, multidrug treatment (usually as outpatients), mass chest radiograph screening, addressing patients' needs by almoners and nurses, an allowance scheme for patients undergoing treatment and the vaccination of infants and young children (Fig. 1).[4,5]

Policy-wise, tuberculosis control in Singapore was started by the British colonial government. In 1948, after widespread criticism, the British colonial government reluctantly made tuberculosis control an important part of its 10-year Medical Plan and converted Tan Tock Seng Hospital into a sanatorium.[6] A decade later, more reforms were instituted that included compulsory notification of the disease and the establishment of a central registry of cases maintained by the Tuberculosis Control Unit (TBCU), a newly formed agency under the purview of the Ministry of Health (MOH) which coordinated all aspects of tuberculosis control.

After 1959, the government built and improved on the colonial precedents, especially by using TBCU as a coordinating body. Its political commitment effectively elevated tuberculosis control to a national policy such as the conduct of mass chest radiograph screening of the local population according to district. The equally expansive urban renewal and public housing programmes undertaken by the Housing and Development Board and Urban Redevelopment Authority played a complementary role when they relocated the populace from congested and insanitary shophouses and villages to clean housing estates and new towns.[7]

There is also an important history of community involvement and participation. The formation of the Singapore Anti-Tuberculosis Association (SATA) in 1947 by businessmen, community leaders and doctors in response to colonial disinterest in combatting tuberculosis was a successful social movement that focussed on anti-tuberculosis work in the community. SATA worked with the government to implement initiatives such as mobile chest radiograph screening, public education and rehabilitation of tuberculosis survivors.[8] SATA also maintained an independent position on important issues that enriched the discussion on tuberculosis control in Singapore. While it usually supported government policy, it disagreed with the need for a centralised registry of tuberculosis cases and the

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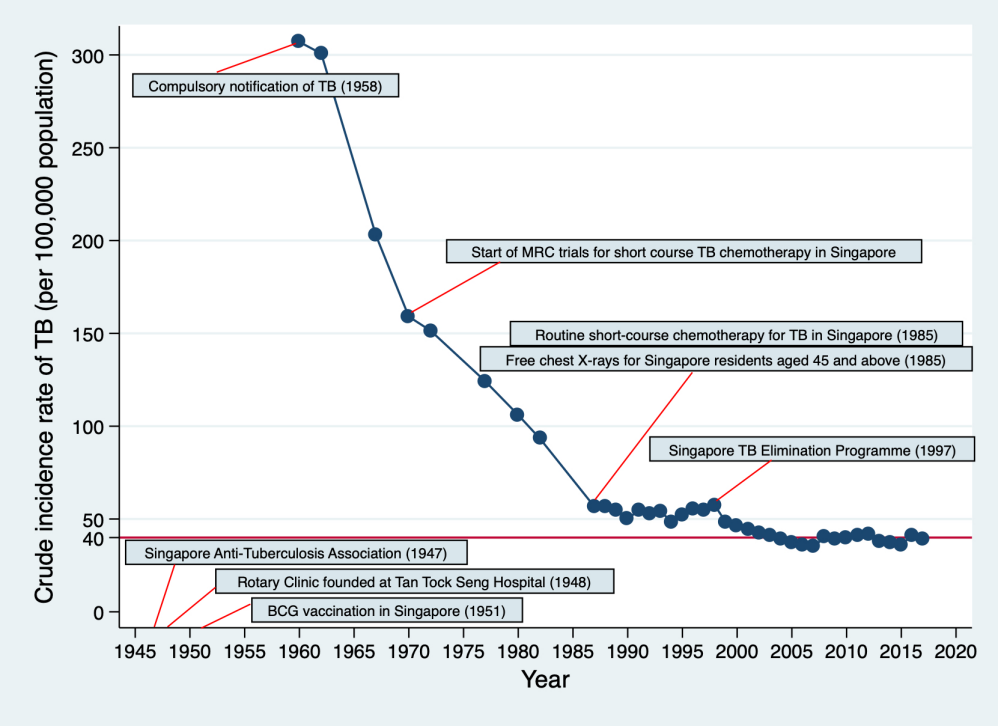

Fig. 1. Graph showing the incidence of tuberculosis in Singapore (1958-2017) and some of the key events in the attempt to control tuberculosis locally. Other than those described in the text, the Rotary Clinic was established in 1948 in Tan Tock Seng Hospital, and it was jointly funded by both the community and the government. The British Medical Research Council (MRC) had conducted a series of clinical trials on short-course chemotherapy for tuberculosis with Singapore being a key recruitment site from 1967 to 1985. BCG: Bacille Calmette-Guérin; TB: Tuberculosis.

proposal for compulsory Bacille Calmette-Guérin (BCG) vaccination, for example.[8]

Even after the country had witnessed a steep decline in the number of reported cases of tuberculosis from the 1960s that resulted in a de-emphasis on tuberculosis relative to other diseases, Singapore did not lose sight of the illness. Government officials, doctors and SATA remained concerned about the prevalence of tuberculosis cases among some social groups, particularly the elderly, as there were patients who did not complete their treatment. Both issues prompted MOH to launch the Singapore Tuberculosis Elimination Programme (STEP) in 1997.[4]

However, the incidence of tuberculosis in Singapore has stagnated since the mid-2000s despite the efforts of STEP and MOH (Fig. 1). This contrasts sharply with the global trend.[1] There were likely several contributing issues including an ageing local population and an expanding migrant worker population drawn from countries with a high incidence of tuberculosis.[9,10] The rollout of directly observed treatment, short course (DOTS) under STEP revealed just how difficult it was for the state to monitor and change patient behaviour even in a tightly regulated country like Singapore. Conversely, despite decades of intensive public health education (which has proven to be particularly successful in the campaign to clamp down on spitting in public, for example), exaggerated fears of infection have forged a persistent social stigma against tuberculosis that has deterred some sufferers from seeking help. This phenomenon has also been reported in other countries.[11]

The emergence of multidrug-resistant tuberculosis and extensively drug-resistant tuberculosis are 2 global trends that are unlikely to diminish in the short term. They will increasingly impact future tuberculosis control in Singapore since they require longer courses of drug therapy that carry greater risks of adverse side-effects and are more costly.[12]

Nonetheless, there are grounds for optimism in the long run. The recently concluded Phase 2b Controlled Trial of the new M72/AS01$_E$ tuberculosis vaccine in Africa demonstrated both safety and a protective efficacy of approximately 54% in an "according-to-protocol efficacy" cohort of 3283 participants, particularly in young adults.[13] Though still a long way from becoming a widely available commercial product, the result marked an important and significant step forward in the iterative process of developing an effective vaccine—generally one of the most cost-effective options to prevent infectious diseases—against tuberculosis that may potentially improve on the current BCG vaccine.

The development of new antituberculosis drugs and breakthroughs in other fields such as immunotherapy offer the distinct possibility of shorter course and potentially less toxic drug regimens in treating multidrug-resistant tuberculosis and drug-susceptible active and latent tuberculosis in the near future. Similarly, advances in tuberculosis diagnostics offer hope of earlier diagnosis and confirmation of tuberculosis which are important to prevent further spread of the disease.[14]

New and imaginative partnerships between the public and private sectors have also emerged worldwide, the most prominent of which is Zero TB Initiative. It was launched in 2016 by a coalition that includes Stop TB Partnership, Harvard Medical School, Advance Access & Delivery (a non-profit company) and Interactive Research and Development (an international non-governmental organisation now based in Singapore). This ambitious initiative aims to create "islands of tuberculosis elimination" by providing support to coalitions of local governments, businesses and society in urban areas to set up comprehensive tuberculosis control strategies that involve case-finding, treatment and prevention of new cases of tuberculosis (including via treatment of latent tuberculosis) at the household level.[15]

In addition to being an early adopter of interventions that showcase cost-effective tuberculosis control, Singapore must continually monitor and uncover high-risk groups to shorten the time to diagnosis and treatment and to minimise the risk of transmission. It is also important to address the issue of disease stigma. Singapore should have a public, ambitious target for tuberculosis control and this might help to generate or focus its resources like in Japan and other high-income countries.

The success of biomedical breakthroughs, initiatives by the public and private sectors and other innovative approaches to tuberculosis control is ultimately less important than the need for governments, businesses and communities to be collectively and continuously engaged in tuberculosis control. Such cooperation has, in the past, marked many of the advances made in reducing the burden of tuberculosis—including in postwar Singapore—and will remain equally crucial in the future.

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