

The Growing Epidemic of MDR- TB and Concerns for Global Health Security

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ABSTRACT

Global health is the health of populations in a global context and transcends the perspectives and concerns of individual nations. In 2012, half a million people were infected with the drug resistant TB, also known as multi-drug resistant-TB (MDR-TB). However, it is estimated that less than a quarter of the actual cases were properly diagnosed. The drug resistant Tuberculosis is confirmed in 37 countries including the developing and G8 countries. MDR-TB, has been recognized as a potentially catastrophic challenge to global public health since it is contagious and carry grave consequences of those who are affected. In 2001 the World Health Assembly's resolution "Global Health Security: epidemic alert and response" linked the health security concept to a global strategy for prevention of movement of communicable diseases across national borders. The biggest challenge is how to ensure that the new medicines are widely available at affordable prices to improve treatment success rates. The total economic burden of TB between 2006 and 2015 for the twenty-two high burden countries is estimated to be about \$3.4 trillion. To address this global security challenge, which costs a lot for the high burden countries, there must be a simplified TB treatment market that will allow for better and more affordable medicines, thereby transforming the lives of those still affected by the disease in a great way. To ensure the global health security, the global community must worktogether with a commitment to buildup sustainable response not limiting to outbreak containment but must strengthen health systems.

Keywords: Tuberculosis, MDR-TB, Global Health, Health Security, Epidemic, End TB Strategy.

INTRODUCTION

Tuberculosis (TB) is an ancient disease that has affected mankind for more than 4,000 years. It is a chronic disease caused by the bacillus *Mycobacterium tuberculosis* and spreads from person to person through air. Global health is the health of populations in a global context and transcends the perspectives and concerns of individual nations. Global health is now considered important for national and international security, domestic and global economic wellbeing.¹ As per the Commission on Human Security established by the United Nations, there are seven dimensions of human security of which health security is one of them. In 2001 the World Health Assembly's resolution "Global Health Security: epidemic alert and response" linked the health security concept to a global strategy for prevention of movement of communicable diseases across national borders. This resolution supported the revision of the International Health Regulations (IHR) and was the first step in associating global health security with IHR compliance.² TB drug resistance is

characterized both by the types of drugs to which the bacteria lack susceptibility and the manner in which resistance was acquired. Resistance to single agents is the most common type; resistance to multiple agents is less frequent, but of greater concern. By convention, "multidrug resistance" (MDR) is defined as resistance to at least isoniazid and rifampin drugs. The World health Organization (WHO) has now classified MDR-TB as a global health security risk and estimates that as many as five million people will be infected with it by 2015.³ It also says that a third of the total 9 million people who contract the disease in any form each year do not receive the care they need, thereby resulting in a big treatment gap. This gap leads to drug resistance spreading around the world at an alarming rate and has given rise to incurable strains of totally drug-resistant TB - which cannot be treated with any known medicines. WHO called for multidrug-resistant tuberculosis (MDR-TB) to be "recognized as a public health crisis and says the contagious, deadly superbug forms of the disease carry grave consequences for those affected".

EPIDEMIOLOGY OF MDR-TB

In 2012, half a million people were infected with the drug resistant TB, also known as multi-drug resistant-TB (MDR-TB). However, it is estimated that less than a quarter of the actual cases were properly diagnosed. The drug resistant Tuberculosis is confirmed in 37 countries including the developing and G8 countries. MDR-TB, has been recognized as a potentially catastrophic challenge to global public health since it is contagious and the superbug forms of the disease carry grave consequences of those who are affected. Major outbreaks of MDR-TB have been reported in the former Soviet Union, and low levels of MDR-TB in countries with high rates of TB, such as Peru, have resulted in large numbers of patients with disease. As a consequence, drug-resistant TB now constitutes a global problem.⁴ The global threat of MDR tuberculosis has great significance for the field of public health. For one thing, its very existence is a reflection of weaknesses in tuberculosis management, which should

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How to cite this article: Vijay Kumar Chattu, Soosanna Kumary. The growing epidemic of MDR- TB and concerns for global health security. International Journal of Contemporary Medical Research 2016;3 (2):329-331.

minimize the emergence of drug resistance.⁵ MDR TB is a major health challenge in India that is gaining increasing public attention and the epidemic is transitioning from a treatment-generated to transmission-generated epidemic. The challenge of addressing TB and MDR TB is critical for India, which is home to over 25% of world's TB cases.⁶ In 1997, the Revised National Tuberculosis Control Programme (RNTCP) implemented the World Health Organization's (WHO) Directly Observed Treatment Short-Course (DOTS) strategy and DOTS-Plus program for systematic treatment of MDR TB in 2007, though population coverage with DOTS-Plus had only reached 26% in 2011.⁷ As the treatment of MDR TB is more complex than drug sensitive TB, and as access to laboratory facilities is needed for diagnosis, the actual provision of the MDR TB services was to be carried out in designated DOTS-Plus sites. Although the aim was to treat 30,000 MDR TB cases annually by 2012-2013, by the end of 2011, just 10,267 MDR patients had been diagnosed, and only 6,994 were provided treatment. However, it is becoming clear that progress is being made, as in Mumbai it was said in June 2013 that 3,600 patients were being treated for MDR TB, whereas two years earlier Mumbai was treating only 280 such patients. In Tamil Nadu, India, 3.4% of new cases had MDR-TB, the prevalence of isoniazid resistance was found in 15%, and rifampin resistance in 4.4%. Various studies have found MDR TB levels of about 3% in new cases and around 12-17% in retreatment cases. However, even if there are such a small percentage of cases, it still translates into large absolute numbers in India. As per TB India Annual report of 2014, a total of 23289 cases of MDR TB were diagnosed of which 20763 were put on treatment however mortality and default are still around 20% each in 2013. Airborne infection control is crucial for preventing the spread of TB from person to person, as well as reducing the risk of TB among health workers in institutional settings. Private clinics in India are often used by patients seeking TB treatment and may employ treatment regimens not recommended by national or international guidelines with resulting suboptimal effectiveness⁸, potentially generating MDR TB'. One of the key obstacles in dealing with drug resistance strains effectively is that lot of patients who got infected were unaware of it or getting the wrong treatment or not at all treated. Moreover the rising healthcare costs make the poor countries unable to cope up with the challenging situation. There are places where the samples are sent to other regions for testing, sometimes as they have only one central laboratory with limited capacity to diagnose the MDR-TB.

END TB STRATEGY 2015

The WHO's "End TB Strategy" for the World TB day 2015 envisions a world free of TB with zero deaths, disease and suffering. It sets targets and outlines actions for governments and partners to provide patient-centered care, pursue policies and systems that enable prevention and care, and drive research and innovations needed to end the epidemic and eliminate TB. The best information on the global TB comes from the WHO, with South East Asia holding the highest number

of people infected with TB in the world. The worldwide annual incidence continues to increase in Africa with 85% new cases because of the HIV/AIDS epidemic.⁹

WHO estimates that atleast one third of the nearly 36 million of people living with HIV/AIDS (PLHIVs) are also infected with TB. Since TB is the top cause of death among PLHIVs in sub-Saharan Africa, to achieve the millennium development goal of a 50% reduction of TB related deaths is an integral to achieve an AIDS- free generation.¹⁰ In 2014, WHO director general Margaret Chan made a statement that "Earlier and faster diagnosis of all forms of TB is vital," as it improves the chances of people getting the right treatment and being cured, and it helps stop spread of drug-resistant disease.

ADVANCES IN MDR-TB MANAGEMENT

There is a need for evidence based interventions that can be implemented to treat the established infections and prevent the new ones from happening.¹¹ WHO is taking serious action to try and control MDR-TB. New tests have been developed that are able to diagnose TB much quicker. However, it is difficult to get the technology to areas of the globe which need it most. The 2014 World TB Day focused on the three million people who were infected with TB and "missed" by health systems. Through UNITAID-funded projects implemented by the World Health Organization (WHO) and the Stop TB Partnership, more patients are being identified in high-burden countries. These initiatives have scaled up lab-based services and introduced new rapid technologies which shorten the time to diagnose drug-resistant strains of TB from weeks to only a few hours. EXPAND-TB (Expanding Access to New Diagnostics for TB) is an international project created to help raise awareness of and fight against the TB superbug. Countries involved with the program have seen their numbers of diagnosed cases of TB tripled. UNITAID has made grants to the EXPAND-TB project which is providing state-of-the-art testing facilities to 100 labs in 27 high burden countries with 40% of the problem, and through its TBxpert project which has brought 220 state-of-the-art GeneXpert machines to 21 countries and a 40% price reduction for the test cartridges, for 145 countries. During 2009 to 2013, the number of MDR-TB cases diagnosed in these countries tripled and with the help of this project, it has enabled more patients to be treated with second-line TB medicines and has helped reduce the price of these medicines by one-third.

In 2013, the US Food and Drug Administration (FDA) approved the first new TB medicine (Sirturo or bedaquiline) in over 40 years which works by inhibiting an enzyme needed by M. Tuberculosis to replicate and spread throughout the body. Recently the European Medicines Agency (EMA) granted temporary approval of a second MDR-TB drug (Delaminid or Delytyba), and new shorter regimens lasting only nine months are showing great potential. Delaminid is a dihydro-nitroimidazooxazole and acts by inhibiting the synthesis of cell wall components, methoxy mycolic acid and keto mycolic acid. Medicines for the 500,000 annual pedi-

atric total TB cases also remain a particular issue, with none currently available that meet WHO guidelines. There is a great need to develop adapted formulations and make them available as quickly as possible.¹² The biggest challenge is how to ensure that these new medicines are widely available at affordable prices to improve treatment success rates. The total economic burden of TB between 2006 and 2015 for the twenty-two high burden countries is estimated to be about \$3.4 trillion. To address this global security challenge, which costs a lot for the high burden countries, there must be a simplified TB treatment market that will allow for better and more affordable medicines, thereby transforming the lives of those still affected by the disease in a great way.

CONCLUSIONS

The emerging MDR TB suggests that there is a failure to implement the measures recommended by WHO's STOP TB Strategy which emphasizes expanding the high quality DOTS programs, strengthening healthcare systems, addressing HIV associated TB and drug resistance and encouraging all providers to follow the good practices and the standard guidelines. In countries with low MDR-TB, efforts should be concentrated on preventing acquired MDR-TB by widely implementing the WHO DOTS strategy and in places with high MDR-TB, management efforts should tailor treatment by performing drug susceptibility testing. The development of better and more rapid diagnostic assays and new classes of anti-TB drugs are urgent priorities for the containment of MDR-TB. To ensure the global health security, the global community must work together with a commitment to build-up sustainable response not limiting to outbreak containment but must strengthen health systems. The nations should emphasize and put in practice the unequivocal statement of the WHO that "functioning health systems are the bedrock of health security"

ACKNOWLEDGEMENTS

The authors wish to thank the reviewers and editors of IJC-MR whose comments and reviews strengthened this work. The authors also are grateful to the authors and publishers of all those articles, and journals from where the literature for this article has been reviewed and discussed.

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Source of Support: Nil; **Conflict of Interest:** None

Submitted: 09-12-2015; **Published online:** 30-12-2015