Globalization and the Spread of Multi-Drug Resistant Tuberculosis

Dr. Jalal-Eddeen Abubakar Saleh, PH.D, MPH, DM, MD Dr. Haruna Ismaila Adamu, PH.D(c), MPH, MD
World Health Organization, Bauchi Zonal Office, Bauchi State, Nigeria

Abstract
Background Tuberculosis (TB), a disease caused by infection with *Mycobacterium tuberculosis*, affects more than one-third of the world's population with approximately 9 million new cases and a death toll of one and a half million in 2013. A disease that is primarily airborne in its transmission in greater majority of cases and thus it is not possible to become infected without being exposed to the causative agent. This disease, which was well under control within the past decade or two, is now re-emerging and posing a threat across the globe and especially the sub-Saharan Africa. There is no doubt that the negative attributes of Globalisation play an important role especially in the spread of the multidrug resistant TB (MDR-TB) and extensively drug-resistant TB (XDR) TB from countries with reported cases through a human host. Moreover, the combination of a large population of HIV-infected susceptible hosts with poor TB treatment success rates coupled with increased level of poverty among the populace, all of which is linked to globalisation, also contribute to the re-emergence of TB, and the emergence of MDR-TB and XDR-TB.**Method** Review of relevant literatures was conducted using manual library search and Internet articles. Other relevant websites were also visited to source for information.
Results Suggested that collaboration between various countries would go a long way to contend the spread of MDR-TB and XDR-TB. This is possible by adopting important measures like the provision of well equipped infection control units at the entry points of various countries, training of TB specialists and medical personnel, provision of effective TB control programmes, enhanced TB surveillance system, economic empowerment of the resource poor communities, re-structuring the health reforms and increase public awareness campaigns.**Conclusion** Considering the fact that globalization plays an important role in the spread of MDR tuberculosis, there is a need for policy makers and international partner organizations to increase their collaborations and to strengthen all required measures to curtail the spread of this deadly but completely curable disease, whose treatment is, in economic terms, cost effective.
Keywords Globalisation, Tuberculosis, Multidrug Resistance TB, and extensively drug-resistant TB (XDR) TB.

INTRODUCTION

Tuberculosis (TB), a disease often associated with poverty, is second only Human Immunodeficiency Virus (HIV/AIDS) as the greatest cause of death in the world due to a single infectious agent.[1] It affects more than one-third of the world's population with 9 million new cases and a death toll of one and a half million in 2013.[1] Greater burden of the disease is seen in the least developing countries especially the sub-Saharan Africa, South-East Asia and Afghanistan, some Central and South American countries. Out of this figure, 1.1million (13%) are also HIV positive out of which 80 per cent (four out of every 5 HIV positive TB cases) were from Africa 10 per cent from Southeast Asia.[2] Airborne route is the most common route of transmission for the greater majority of TB cases across the globe and thus it is not possible to become infected without being exposed to the causative agent.[3]

Globalisation and more specifically global migration have greatly affected the epidemiology of tuberculosis in both developed and developing countries alike.[4] It is also well known that inadequate treatment has led to the emergence of multidrug resistant strains of TB, a serious problem that cannot be treated with a first line anti-TB regimen. Multidrug resistant TB (MDR-TB) results due to infection with strain of TB that is resistant to at least isoniazid and rifampicin, and extreme drug resistant TB (XDR-TB) as a result of infection with strain that is resistant to at least isoniazid, rifampicin, an injectable drug (such as capreomycin, kanamycin or amikacin) and one of the fluoroquinolones.[5-7] MDR-TB and XDR-TB has now become a global problem not only in countries with high prevalence of TB but also in those with low prevalence as well.

Nigeria with an estimated 570,000 TB cases in 2013, is third (after India and China) amongst the 22 high-burden countries, and collectively accounts for 80 per cent of the global TB burden.[2] The rise in cases of TB seen across the globe is related not only to the rise in HIV infection especially in the sub-Saharan Africa but also to other reasons which include the increasing disparities in wealth and lack of access to health services, free movement of individuals across the globe, health system reforms and lack of commitment of some governments towards provision of adequate health care services to the populace especially in the world poorest countries. In industrialised countries, due to increase in migration and free movement across trans-borders, individuals with latent TB infection are making a greater percentage of TB cases despite the fact that greater per cent of the disease is seen in the developing countries.[3]

The disease poses a threat not only to developing countries but also the developed ones due to global

migration where people transcend across borders either due to business, leisure, asylum seekers or as refugees. In Nigeria, like some other countries of the world, the disease was under control within the past decade notwithstanding the fact that there were some reported new cases from various surveillance units of the epidemiological departments of the ministry of health from time to time.[2,8] Globalisation has its own negative attributes in this regard especially in the spread of the MDR-TB and XDR-TB from those countries with reported cases through a human host by means of air, sea or land.[2,8] Furthermore, increase number of tourists vis-a-vis 'sex tourism' (wealthy individuals from economically sound countries travelling to poor countries to exploit the economically disadvantaged ones) thus the poor ones especially women becoming more vulnerable, also facilitates the rising number of HIV/AIDS, a disease which often co-exists with TB as it weakens the immune status of the patients. Increased level of poverty among the populace which has its link to globalisation, also contributed to the re-emergence of TB and recently MDR-TB and possibly XDR-TB because of inability of the poor to access health centres or even afford or comply with their medications.[2,8] As at 2013, global estimated figure for MDR-TB stood at about 480,000 cases (including 300,000 new cases) with more than half of this burden in three countries: India, China and Russian Federation, while Nigeria accounts for less than 1.0 per cent of the global estimated MDR-TB cases in 2013.[2,8] There are 100 countries (Nigeria included) who had reported cases of extensively drug-resistant (XDR) tuberculosis in 2013.[2,8]

In the USA, there were about 400,000 immigrants and 50,000 to 70,000 refugees annually and many of them from countries with a high incidence of tuberculosis thus substantially contributing to the TB burden among foreign born in the USAs.[9,10] It has been estimated in 2007 that about 57.8 per cent new cases of TB were from foreign-born persons with a rate of 20.6 cases and 2.1 cases per 100,000 populations among foreign-born and U.S.-born persons respectively.[10-12] It has also been observed that 27.5% of TB cases among the foreign born persons are diagnosed within two years of their arrival in the United States.[13]

GLOBALISATION

Infection results from interplay between host, pathogen and the environment, notably increased mobility of populations with an increase likelihood of infectious disease outbreak between countries. Several studies have underscored the role globalisation is playing in this regard.[2,8]

In order to fully understand the linkage between globalisation and health especially in the context of this rising cases of TB, it is worth defining what the term globalisation stands for. Globalisation is defined as ''a set of global processes that are changing the nature of human interaction across a wide range of social spheres including the economic, political, cultural and environmental.''[2,8] It has been shown that new and emerging infectious diseases often arise due to changes seen in the host (e.g. immune-compromised status), pathogen (e.g. resistance to antibiotics) and environment (e.g. increase mobility of populations, global warming).[2,8] The rise in TB cases (and especially MDR-TB and XDR-TB) seen in recent times in especially some developing countries is not unconnected with the effect of globalisation; this is considering the fact that there is an increase in population mobility across the globe and also health system reforms.[2,8] It cannot be disputed that globalisation has lead to increase interdependence of different countries across the globe thus issue of spread (and control) of infectious diseases is a source of concern at both national and international levels. This raises the issue of new and emergence of infectious diseases, population at risk and quarantine as a measure to preventing their spread. It is also arguable that the threat of infectious diseases in relation to population movement has long been recognized not something that is beginning to happen recently as a result of globalisation. An example here is ''September 1665 when a plague came to the English village of Eyam, Derbyshire, probably via fleas in a box of cloth brought from London. The villagers, realising the threat they posed to the surrounding communities, went into voluntary quarantine. In turn, residents of the surrounding area left provisions on the village boundary.''[2,8] Globalisation could also negatively impact on the broad determinants of health especially in the developing countries (e.g. income, employment opportunities, housing) thus making certain populations more or less prone to infections. Rapid urbanisation with poor housing would predispose more of the populace to infectious diseases especially in situations of outbreaks.[2,8]

Increase population mobility: It cannot be disputed that the world is changing in different ways with both positive and negative impacts on human health. However, it is very obvious that two decades ago, most people stayed near or where they were born and raised for the fact that travelling was rare and not easily affordable. In the present generation, there is an increasing rate of travelling (spatial dimension) across borders which could be due to business, studies, pleasure, tourism, as a migrant worker, as a refugee, asylum, etc. It is worth noting that about 2 million people travel across international boundaries for one reason or the other, thus making previously unaffected populations more vulnerable to new infections especially in areas where neither existed in the past. Statistics have shown that about 175 million people (2.9 per cent of the world's populations) were living outside their country of birth in 2000, reflecting an increase from 100 million (1.8 per cent of world's population) in 1995, and more than doubling since 1965.[14] In view of this, people are much more prone to contacting or contracting

communicable diseases in the course of their movements and coming back to their primary area of stay or home towns to spread them around. It is worth mentioning that some of these travellers move along with their animals and microbes as well.

In some cases, the causal connections between global changes taking place and health is direct whereas in some there is relative scarcity of evidence to support that, leading to some individuals questioning if at all there is globalisation taking place. It is important to be aware that globalisation is a complex process that we need to untangle to be able to have a good understanding of its health consequences. There are three dimensions of global change to serve as a framework for the understanding of globalisation; these are spatial, temporal and cognitive.[2,8]

It is well known that the physical world has been same in terms of size since its creation except for the fact that there are changes to the way we interact across the territorial space and physical distances as a result of globalisation. The spatial dimension as explained above is basically the increase in population mobility unlike in the past two decades. The temporal aspect is in relation to how we perceive and experience time. Technological advancement made it easier for us to travel long distances within a shorter time frame due to high-speed trains, long-haul flights, and automobiles. People, unlike in the past, spend more time travelling because of the availability of cheaper flights and decline in the cost of transportation. It has been shown that air transport, the financial cost per passenger, mile has dropped from US$0.68 to US$0.11 due to advancement in airplane design and size, and economies of scale in addition to market forces.[2,8,15] The cognitive aspect, though not directly related to the spread of TB and other infectious diseases, refers to globalisation vis-a-vis the way we think about ourselves and the world around us. These and other impacts of globalisation on health is paving a new way as to how we view the issue of health globally with a shift from international to global health, defined as ‘’a health issue where the determinants circumvent, undermine, or are oblivious to the territorial boundaries of states and thus beyond the capacity of individual countries to address through domestic institutions.’’[2,8]

Health system reforms: There is no doubt that health reforms have negative impacts especially to the poor and thus contributing to new and emergence of infectious diseases. In 1980s through 1990s, there is a change at the international arena as regards the issue of health based on humanitarian grounds vis-a-vis the issue of economic growth and security. The World Bank’s 1993 report ‘Investing in Health Care’ lays emphasis on these two: first the introduction of market forces into the health care sector and the allocation of public resources according to ‘criteria of technical and instrumental efficiency’ and second on health care re-organisation for the state to withdraw from financing and provision of health services and re-orientation of public institutions towards selective assistance. This health reforms in developing countries lead to cut of resources in public health services by various governments thus leading to deterioration in of the already ‘frail’ health care sector thus limiting access to health care services to the poor especially women.[2,7,8] TB, as mentioned earlier, is a disease commonly associated with poverty and thrives well in the poor due to their inability to pay for their health needs; this makes them vulnerable to spreading the disease especially to those in close contact with them either in their houses, working place, market areas or schools. In view of this and considering the fact that treatment often lasts for at least six months, TB patients already on the anti-TB drugs may end up not being able to afford and or comply with their medications due to cost, thus leading to the emergence of MDR-TB. It could be argued that though there are some non-governmental organisations and private organisations into play in providing service as well, but this is limited and not readily available or accessible especially to the poor.

Rapid Urbanization: This lead to people in large number, especially in developing countries, migrating from the rural to urban cities with the aim of achieving economic prosperity. In addition to overcrowding, most often the houses that they leave in the cities are of poor standards with poor ventilation leading to increase chances of spread of infectious diseases especially the airborne types.[2,8]

Globalisation and poverty: There is no doubt that economic globalisation brought development and growth in some economies, thus increasing wealth and resources for people to be able to access and buy health. In other populations, globalisation leads to increase poverty, unemployment, economic insecurity, poor living conditions and adversely increasing the risk of infectious diseases in all ramifications.[2,8]

MEASURES

In view of the aforementioned, the infectious disease units of the ministry of health of various governments of especially developing countries should incorporate these measures to be able to tackle the global aspect of this problem starting from local level to international collaboration:

- Provision of infectious control units at entry points: government should ensure the availability at all immigration entry points an infectious control unit with necessary equipments (x-ray machines,

standard laboratory etc) installed for screening all suspected visitors and asylum seekers especially those coming from areas with reported cases of MDR-TB and XDR-TB. There is also a need for governments to increase fund to the health ministry to be able to meet to the cost of installing and operating x-ray machines and standard laboratory to be able to implement this in collaboration with the immigration department of the ministry of internal affairs. Furthermore, training and stationing of medical personnel to operate those machines should be given utmost attention with a view to achieving the desired objective.

- Training of TB specialists and medical personnel: There is a need to train and motivate clinicians in the field of TB to be able to detect high index case in those immigrants from areas with reported cases of MDR/XDR-TB, especially if on or after arrivals they presented with symptoms of chronic cough, fever or weight loss. The diagnosis depends on considering TB in the differential diagnosis and submitting appropriate specimens for culture. Initiation of prompt, appropriate drug treatment and assurance of completion of therapy is possible when a strong public health program for TB control operates collaboratively with treating physicians.
- Provision of effective TB control programme: The cost burden of containing TB, MDR-TB and XDR-TB by developing countries far exceed the total budget of their health care, hence the need to partner with international organisations like the Green Light Committee, World Health Assembly, STOP TB Partnership, Global Fund etc with a view to get aid to be able to effectively control this scourge. National reference laboratory with outlets in the various states are to be in place for prompt diagnosis and early detection of resistant cases.
- Enhanced surveillance: This is with a view to co-ordinate reporting of any TB, MDR-TB and XDR-TB case or outbreaks at local, national and international levels. It is well to say that surveillance remains more of a local activity since data needs to be collected from local level and action taken at the area of outbreaks promptly in time and space. Furthermore, collaboration with other countries should be observed in terms of reporting outbreaks; information should not be withheld in fear of other countries isolating goods and visitors from countries with reported outbreaks. Cooperation in this regard would enable rapid identification of the problem and measures to curb it implemented with assistance from the global community. This can be done by proper computerisation and having Internet access at all the infectious disease control units in the country.
- Economic empowerment: This is by empowering the poor resourcefully to be able to reduce or eradicate poverty thereby enabling them purchase and have access to health care. This can be by giving short-term loans to especially the TB patients to be co-ordinated by the infectious diseases unit of the health ministry through various TB clinics or creating programmes that will alleviate poverty.
- Public awareness campaign: This can be by means of advertisement educating people on the importance of adhering to TB treatment regimen and ways of accessing treatment and also on government and NGOs efforts towards control of the disease. This can be done through all media out lets, print, television, radio, billboards etc.
- Re-structuring the health reforms: In view of the negative attributes of health reforms in most developing countries by introducing market forces into the health sector and removal of government finances towards provision of health services, government should reconsider its stand in this regard. The infectious disease unit should be able to ensure that government exempts all TB cases from paying for their drugs, investigations and other medical services and further supervise the administration of their drugs by adopting the DOTS strategy (directly observed treatment short course). This would go a long way at ensuring that patients comply with their medications to achieve a full cure of this debilitating but totally curable disease. It should be borne in mind that this is capital intensive both in terms of provision of the drugs, laboratory services and man power aspect hence the need for additional resource for the disease control unit to be able to effectively carryout this.

CONCLUSION

In view of the negative consequences of globalisation and the potential threat posed by MDR and XDR tuberculosis in this present global economic downturn, there is a need for global key players to be well committed both financially and politically towards containing the spread of these cursed duets. This is a disease though deadly but is completely curable, which in economic terms its treatment is said to be cost effective.

REFERENCE

1. WHO (2015). Tuberculosis Fact Sheet N°104. Retrieved from http://www.who.int/mediacentre/factsheets/fs104/en/
2. Global Tuberculosis Report (2014). World Health Organization. Retrieved from http://apps.who.int/iris/bitstream/10665/137094/1/9789241564809_eng.pdf?ua=1

3. Enarson, D.A. and Murray, J.F. (1996). 'Global epidemiology of tuberculosis'. In *Tuberculosis* (Rom WN and Garay S). USA: Little, Brown and Company, pp. 57-75.
4. Frieden, T.R., Sterling, T.R., Munsiff, S.S., Watt, C.J., and Dye, C. (2003). Tuberculosis. *Lancet*; 362:887-99.
5. Crofton, J., Chaulet, P., and Maher, D. (1997). *Guidelines for the management of drug-resistant tuberculosis.* Publication No. WHO/TB96.210 (Rev.1). Geneva, World Health Organization, 1997.
6. Caminero, J.A. (2004). *A Tuberculosis Guide for Specialist Physicians* Paris: International Union Against Tuberculosis and Lung Disease, pp. 228-267.
7. WHO (2004). *TB/HIV: A clinical manual (2nd Edition)*. Publication No. WHO/HTM/TB/2004.329. Geneva, World Health Organisation.
8. Lee, K. and Collin, J. (2005). *Global change and Health*, Open University Press, London.
9. Cain, K.P., Benoit, S.R., Winston, C.A., Mac Kenzie, and W.R. (2008). Tuberculosis among foreign-born persons in the United States. *JAMA* 2008;300:405-12.
10. U.S. Immigration Services (2007). Yearbook of immigration statistics: 2006. Washington, DC: Department of Homeland Security. (Accessed May 11, 2009, at http://www.dhs.gov/xlibrary/assets/statistics/yearbook/2006/OIS_2006 _Yearbook.pdf.)
11. Dye, C., Watt, C.J., Bleed, D.M., Hosseini, S.M., and Raviglione, M.C. (2005). Evolution of tuberculosis control and prospects for reducing tuberculosis incidence, prevalence, and deaths globally. *JAMA*;293:2767-75.
12. WHO (2007). Global tuberculosis control — surveillance, planning, financing. 2007. (Report no. WHO/HTM/TB/2007.376). (Accessed May 11, 2009, at http://www.who.int/tb/publications/ global_report/2007/en/index.html.)
13. US MMWR (2007). Trends in tuberculosis. MMWR Morb Mortal Wkly Rep 2008; 57:281-5.
14. Stilwell, B., Diallo, K., and Zurn, P. (2004). 'Migration of health care workers from developing countries: strategic approach to its management'. *Bulletin of the World Health Organisations*, 82(8):595-600.
15. UNDP (1999). *Human Development Report*. New York: United Nations Development Programme.

The IISTE is a pioneer in the Open-Access hosting service and academic event management. The aim of the firm is Accelerating Global Knowledge Sharing.

More information about the firm can be found on the homepage:
http://www.iiste.org

CALL FOR JOURNAL PAPERS

There are more than 30 peer-reviewed academic journals hosted under the hosting platform.

Prospective authors of journals can find the submission instruction on the following page: http://www.iiste.org/journals/ All the journals articles are available online to the readers all over the world without financial, legal, or technical barriers other than those inseparable from gaining access to the internet itself. Paper version of the journals is also available upon request of readers and authors.

MORE RESOURCES

Book publication information: http://www.iiste.org/book/

Academic conference: http://www.iiste.org/conference/upcoming-conferences-call-for-paper/

IISTE Knowledge Sharing Partners

EBSCO, Index Copernicus, Ulrich's Periodicals Directory, JournalTOCS, PKP Open Archives Harvester, Bielefeld Academic Search Engine, Elektronische Zeitschriftenbibliothek EZB, Open J-Gate, OCLC WorldCat, Universe Digtial Library , NewJour, Google Scholar