

Antibiotic Resistance: A Complete Trouble Maker for Healthcare System Especially among Lower and Middle-Income Countries

Mainul Haque*

Faculty of Medicine and Defence Health, University Pertahanan Nasional Malaysia, (National Defence University of Malaysia), Kem Perdana Sungai Besi, Kuala Lumpur, MALAYSIA.

Internationally, antibiotic resistance (ABR) is a quickly deteriorating public health status, particularly among Lower and Middle-Income Countries (LMICs).^[1,2] Though evidence regarding ABR suggests a high rate in quite a lot of LMICs. The archetypal statistics regarding ABR remain scarce in many parts of these countries.^[1-4] Overall, globally extensive AMR situation suggestively increases patient morbidity and mortality. AMR each year is taxing 2,00,000 life and \$20 billion in excess healthcare expenditure because of antimicrobial-resistant pathogens.^[5,6] AMR is demarcated as the resistance of microbes to an antimicrobial agent against which they formerly had an either bactericidal or bacteriostatic effect. Though AMR is a natural evolutionary phenomenon, it is propagated augmented through the defective, poor practice of both health professionals and patients, such as the misuse and overuse of antimicrobial medicines, poor sanitation, low vaccination rates and poor infection control practices expressly among low-resource countries.^[2,3,7] Additionally, multiple research studies advocated the natural process of resistance enhance because of ever-increasing irrational, imprudent antimicrobial utilization is responsible as the principal chauffeur for the community-acquired AMR, exclusively in the LMICs.^[8-10] As early as the 1940s, resistance to sulphonamides and penicillin was identified trailed by resistance to other clinically utilized antimicrobials.^[2] The issue over-prescribing, unnecessary utilization of antimicrobials and AMR were raised by Sir Alexander Fleming in his life-time in 1945 in an admonitory tale.^[11] Currently, the management of virtually all most all infectious diseases of public health concern is complicated with the plague of AMR.^[12,13] Center for Disease Control (CDC), USA advised fighting against such public health threat need to develop collective and concerted international comprehensive tactic across sectors to spot, avert and retort AMR.^[14] As the problem of AMR exists throughout the globe, equally in both low and high resource countries.^[15] Although the volume of delinquent and sufferings among patients due to AMR much higher in LMICs.^[16,17] Additionally, extensive and real fast traveling of the modern human community, animals and goods ensures the smooth spread of AMR genes transversely of the borders and continents.^[14,18,19] Thereafter, a comprehensive approach is of absolute necessity to combat AMR. The CDC suggests that every country around the planet should develop its own policy and planning to thwart AMR infectious disease and further blowout: “i. Implement infection prevention and control practices. ii. Improve antibiotic use, including ensuring access. iii. Implement data and tracking systems to track resistance, guide prevention

strategies and report results at the local and global levels. iv. Improve lab capacity to identify resistant bacteria”.^[14] The last twenty to twenty-five years whole-genome sequencing (WGS) had transformed environmental microbiology and biotechnology. Subsequently, researchers are moving forward to understand in-depth principles, methods and basics of public health, epidemiology, health economics and national productivity to better healthcare for mankind. The next-generation sequencing and metagenomics are available and contribute to detect antibiotic resistance genes, how resistance genes are developed. Afterward, these advanced technologies provide beneficial and valuable information to establish the necessary clinical management method. Although these hi-tech based know-hows offer a lot of assistance to combat the resistance issue, these state-of-the-art involves massive financial involvement, procedural proficiency and data analysis management. In LMICs, implementation such a technology-based program, on many occasions, exorbitant cost and expertise a problematic issue and act as a barricade in low-resource countries.^[20-23] Another study revealed multiple approaches need to gradually be addressed, such as i. proper diagnostic facility testing. ii. Educational intervention among all level’s healthcare professionals and ordinary people. Medical students both under and post-graduates with intern / house-officers. iii. Strengthening national regulatory agencies with stringent effective measures for violation of guidelines regarding the medicine-related issue. iv. Establishment and firming up the overall national healthcare system. v. Reconnoitering comprehensive inter and intra-departmental cooperation between policymakers, academia, professional bodies and civil society. vi. Appropriate policy and planning toward antibiotic stewardship (ABS) program, both for the hospital and community backgrounds.^[3] Thereafter, the antibiotic stewardship program is one best single strategy for LMICs to fight against ABR until new cost-effective intervention appears in the market.^[3,24-29]

CONFLICT OF INTEREST

The author does not possess any conflict of interest.

Orcid ID: 0000-0002-6124-7993

REFERENCES

- Lushniak BD. Antibiotic resistance: A public health crisis. *Public Health Rep.* 2014;129(4):314-6. doi:10.1177/003335491412900402
- Jindal AK, Pandya K, Khan ID. Antimicrobial resistance: A public health challenge. *Med J Armed Forces India.* 2015;71(2):178-81. doi: 10.1016/j.mjafi.2014.04.011
- Cox JA, Vlieghe E, Mendelson M, Wertheim H, Ndegwa L, Villegas MV, et al. Antibiotic stewardship in low- and middle-income countries: The same but different?. *Clin Microbiol Infect.* 2017;23(11):812-8. doi: 10.1016/j.cmi.2017.07.010.
- Haque M, McKimm J, Godman B, Abu BM, Sartelli M. Initiatives to reduce postoperative surgical site infections of the head and neck cancer surgery

ACCESS THIS ARTICLE ONLINE



WWW.AMDHS.ORG

DOI :
10.5530/amdhs.2019.4.12

Haque.: Antibiotic Resistance

1. with a special emphasis on developing countries. *Expert Rev Anticancer Ther.* 2019;19(1):81-92. doi: 10.1080/14737140.2019.1544497.
2. Brown L, Langelier C, Reid MJ, Rutishauser RL, Strnad L. Antimicrobial Resistance: A Call to Action. *Clin Infect Dis.* 2017;64(1):106-7. doi:10.1093/cid/ciw678
3. O'Neil J. Tackling drug-resistant infections globally: Final report and recommendations. Resistance. London, United Kingdom. 2016;1:84. Available at https://amr-review.org/sites/default/files/160518_Final%20paper_with%20cover.pdf
4. Lax MR, Sridhar D, Blaser M, Wang M, Woolhouse M. Achieving global targets for antimicrobial resistance. *Science.* 2016;353(6302):874e5. doi: 10.1126/science.aaf9286.
5. Shrestha P, Cooper BS, Coast J, Oppong R, DoThi TN, Phodha T, *et al.* Enumerating the economic cost of antimicrobial resistance per antibiotic consumed to inform the evaluation of interventions affecting their use. *Antimicrob Resist Infect Control.* 2018;7:98. doi: 10.1186/s13756-018-0384-3.
6. Llor C, Bjerrum L. Antimicrobial resistance: Risk associated with antibiotic overuse and initiatives to reduce the problem. *Ther Adv Drug Saf.* 2014;5(6):229-41. doi:10.1177/2042098614554919.
7. Holmes AH, Moore LS, Sundsfjord A, Steinbakk M, Regmi S, Karkey A, *et al.* Understanding the mechanisms and drivers of antimicrobial resistance. *Lancet.* 2016;387(10014):176-87. doi: 10.1016/S0140-6736(15)00473-0.
8. Aslam B, Wang W, Arshad MI, Khurshid M, Muzammil S, Rasool MH, *et al.* Antibiotic resistance: A rundown of a global crisis. *Infect Drug Resist.* 2018;11:1645-58. doi:10.2147/IDR.S173867
9. Bloom DE, Cadarette D. Infectious Disease Threats in the Twenty-First Century: Strengthening the Global Response. *Front Immunol.* 2019;10:549. doi:10.3389/fimmu.2019.00549
10. Chandler CIR. Current accounts of antimicrobial resistance: Stabilization, individualization and antibiotics as infrastructure. *Palgrave Commun.* 2019;5(1):53. doi: 10.1057/s41599-019-0263-4.
11. Center for Disease Control and Prevention. Combat Antimicrobial Resistance, Globally. Available at <https://www.cdc.gov/drugresistance/intl-activities.html>
12. World Health Organization. Worldwide country situation analysis: Response to antimicrobial resistance. WHO Press, World Health Organization, 20 Avenue Appia, 1211 Geneva 27, Switzerland. 2015. Available at <http://apps.who.int/medicinedocs/documents/s21837en/s21837en.pdf>
13. National Academies of Sciences, Engineering and Medicine; Health and Medicine Division; Board on Global Health; Forum on Microbial Threats. Understanding the Economics of Microbial Threats: Proceedings of a Workshop. Washington (DC): National Academies Press (US). The Cost Dimensions of Antimicrobial Resistance. 2018. Available at <https://www.ncbi.nlm.nih.gov/books/NBK534885/>
14. Littmann J, Viens AM. The Ethical Significance of Antimicrobial Resistance. *Public Health Ethics.* 2015;8(3):209-24. doi:10.1093/phe/phv025
15. Frost I, Boeckel TPV, Pires J, Craig J, Laxminarayan R. Global Geographic Trends in Antimicrobial Resistance: The Role of International Travel. *J Travel Med.* 2019;taz036. doi: 10.1093/jtm/taz036.
16. Founou LL, Founou RC, Essack SY. Antibiotic Resistance in the Food Chain: A Developing Country-Perspective. *Front Microbiol.* 2016;7:1881. doi:10.3389/fmicb.2016.01881
17. Schmieder R, Edwards R. Insights into antibiotic resistance through metagenomic approaches. *Future Microbiol.* 2012;7(1):73-89. doi: 10.2217/fmb.11.135.
18. Köser CU, Ellington MJ, Peacock SJ. Whole-genome sequencing to control antimicrobial resistance. *Trends Genet.* 2014;30(9):401-7. doi: 10.1016/j.tig.2014.07.003.
19. Woodford N, Sundsfjord A. J Molecular detection of antibiotic resistance: When and where?. *J Antimicrob Chemother.* 2005;56(2):259-61. doi: 10.1093/jac/dki195
20. Punina NV, Makridakis NM, Remnev MA, Topunov AF. Whole-genome sequencing targets drug-resistant bacterial infections. *Hum Genomics.* 2015;9:19. doi: 10.1186/s40246-015-0037-z.
21. McLeod M, Ahmad R, Shebl NA, Micallef C, Sim F, Holmes A. A whole-health-economy approach to antimicrobial stewardship: Analysis of current models and future direction. *PLoS Med.* 2019;16(3):e1002774. doi: 10.1371/journal.pmed.1002774
22. Haque M. Antibiotic Use, Antibiotic Resistance and Antibiotic Stewardship – A Global Public Consequences. *Bang J Med Sci.* 2019;18(2):169-70. doi: <https://doi.org/10.3329/bjms.v18i2.40680>
23. Haque M. Antibiotic stewardship, antimicrobials resistance and rational use of medicine. *Austral Med J.* 2017;10(8):743-45. doi: 10.21767/AMJ.2017.3143
24. Wang H, Yu X, Zhou H, Li B, Chen G, Ye Z, *et al.* Impact of antimicrobial stewardship managed by clinical pharmacists on antibiotic use and drug resistance in a Chinese hospital, 2010-2016: A retrospective observational study. *BMJ Open.* 2019;9(8):e026072. doi: 10.1136/bmjopen-2018-026072.
25. DeWith K, Allerberger F, Amann S, Apfalter P, Brodt HR, Eckmanns T, *et al.* Strategies to enhance rational use of antibiotics in hospital: A guideline by the German Society for Infectious Diseases. *Infection.* 2016;44(3):395-439. doi:10.1007/s15010-016-0885-z=
26. Walger P. Rational use of antibiotics. *Internist.* 2016;57(6):551-68. doi: 10.1007/s00108-016-0071-5.

Received: 04 November 2019;

Accepted: 15 December 2019;

***Correspondence to:**

Professor (Dr.) Mainul Haque

Professor of the Unit of Pharmacology, Faculty of Medicine and Defence Health, University Pertahanan Nasional Malaysia, (National Defence University of Malaysia), Kem Perdana Sungai Besi, 57000 Kuala Lumpur; MALAYSIA.

Email: rumurono@gmail.com

Copyright: © the author(s), publisher and licensee OZZIE Publishers. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

This is an open access article distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License

Cite this article as: Haque M. Antibiotic Resistance: A Complete Trouble Maker for Healthcare System Especially among Lower and Middle-Income Countries. *Adv. Med. Dental Health Sci.* 2019;2(4):42-3.