

started revamping the water filtration plant of Jamshoro, Hyderabad, after the judicial commission appointed by the Supreme Court of Pakistan ordered an inquiry into mixing of sewage water into natural waterways.^{8,9} The provincial government has also sanctioned 399.74 million Pakistani rupees for restoration of the water distribution network and 414.13 million Pakistani rupees for revival of the sewage system in Hyderabad.⁹ These initiatives can also curb the practices of using hand-operated water pumps in the vicinity of affected areas, which was one of the reasons cited in the paper, causing mixing of sewage and drinking water.¹ Another initiative that should be started by the government is the education of local people, particularly children, about hygiene practices and use of boiling water in cooking food and drinking through pictorial pamphlets and school education programmes. Another major step that should be made by the newly established Sindh Food authority is the inspection of the local restaurants and eateries for unhygienic practices.

The spread of extensively drug-resistant typhoid should be an alarming sign that the world is slowly moving towards a pre-antibiotic era because of widespread overuse of antibiotics. This has become a serious concern in developing nations such as Pakistan, where antimicrobial surveillance is poor and in urgent need of strengthening. Both governmental and non-governmental organisations in Pakistan need to actively promote vaccination campaigns and healthy hygiene habits and discourage irrational use of antibiotics to prevent the mortality and morbidity associated with increasing antibiotic resistance in pathogens.

We declare no competing interests.

Muhammad Kamran Rasheed,
Syed Shahzad Hasan,
Zaheer-Ud-Din Babar,
*Syed Imran Ahmed
sia194@yahoo.com

Department of Pharmacy Practice, Qassim University, Saudi Arabia (MKR); Department of Pharmacy, University of Huddersfield, Huddersfield, UK (SSH, ZUB); and School of Pharmacy, International Medical University, Kuala Lumpur 57000, Malaysia (SIA)

- 1 Qamar FN, Yousafzai MT, Khalid M, et al. Outbreak investigation of ceftriaxone-resistant *Salmonella enterica* serotype Typhi and its risk factors among the general population in Hyderabad, Pakistan: a matched case-control study. *Lancet Infect Dis* 2018; **18**: 1368–76.
- 2 Baumgaertner E. "We're out of options": doctors battle drug-resistant typhoid outbreak. *The New York Times*, April 13, 2018. <https://www.nytimes.com/2018/04/13/health/drug-resistant-typhoid-epidemic.html> (accessed July 7, 2018).
- 3 Ahmad M. Pakistan is racing to combat the world's first extensively drug-resistant typhoid outbreak. *Sci Am*, March 14, 2018. <https://www.scientificamerican.com/article/pakistan-is-racing-to-combat-the-worlds-first-extensively-drug-resistant-typhoid-outbreak> (accessed May 7, 2018).
- 4 Antillón M, Warren JL, Crawford FW, et al. The burden of typhoid fever in low- and middle-income countries: a meta-regression approach. *PLoS Negl Trop Dis* 2017; **11**: e0005376.
- 5 Dalton J. Typhoid superbug in Pakistan raises fears of global antibiotic failure. Independent, April 17, 2018. <https://www.independent.co.uk/news/world/asia/typhoid-superbug-pakistan-global-antibiotic-failure-a8307836.html> (accessed July 5, 2018).
- 6 US warns Pakistan against outbreak of drug-resistant typhoid fever. *Dawn*, July 5, 2018. <https://www.dawn.com/news/1418058> (accessed July 5, 2018).
- 7 WHO. Joint external evaluation of IHR core capacities of the Islamic Republic of Pakistan. Mission report: 27 April–6 May 2016. Geneva: World Health Organization, 2016. <http://www.who.int/ihr/publications/WHO-WHE-CPI-2017/9/en/> (accessed July 20, 2018).
- 8 Inquiry ordered into disposal of sewage into natural waterways. *Dawn*, Dec 24, 2018. <https://www.dawn.com/news/1453181> (accessed Dec 24, 2018).
- 9 Water Commission's interim report identifies measures taken. *Pakistan Observer*, Dec 13, 2018. <https://pakobserver.net/water-commissions-interim-report-identifies-measures-taken/> (accessed Dec 24, 2018).

Macrolide resistance in *Streptococcus* spp

In their Review in *The Lancet Infectious Diseases*, Kieran O'Brien and colleagues¹ extensively examined antimicrobial resistance following mass azithromycin distribution for trachoma. Their results were of great interest, particularly with regards to macrolide resistance in *Streptococcus*

pneumoniae, the main target organism of the studies included in the Review.

As they discussed, the use of azithromycin might induce macrolide resistance in other organisms. They mentioned *Escherichia coli* and *Staphylococcus aureus* as examples of macrolide-resistant organisms other than *S pneumoniae*. However, several other organisms might be appropriate candidates for continued surveillance of antimicrobial resistance.

According to a report from the Japan Nosocomial Infections Surveillance,² 34.4% of *Streptococcus pyogenes* and 33.5% of *Streptococcus agalactiae* showed macrolide resistance. *S pyogenes* is a major cause of bacterial pharyngitis and rheumatic fever in children and sometimes causes severe infection such as necrotising fasciitis. *S agalactiae* is the most important causative organism of neonatal sepsis. Both are sensitive to penicillin, so usually treatment selection is not difficult. Nevertheless, macrolides are a useful option for patients with penicillin allergy.³ This alternative has unfortunately been lost in clinical settings in Japan, and the same thing might happen in other countries in the near future.

Japan Antimicrobial Consumption Surveillance and the AMR Clinical Reference Center provide statistical information about antimicrobial consumption.⁴ They reported that larger amounts of macrolide are consumed in Japan than in EU and European Economic Area member states (4.84 defined daily doses per 1000 inhabitants per day [DID] in 2013 in Japan and 3.1 DID in 2013–14 in the EU and European Economic Area).^{4,5} Although further research is required to understand the factors that contribute to this high proportion of macrolide resistance, the association between larger amounts of consumption and high proportions of resistance is difficult to deny.

We intend to continue longitudinal antimicrobial resistance surveillance, including *Streptococcus* spp other than

S pneumoniae, to fully understand the effects of antimicrobial use. We hope our activities will generate interest from other countries.

I declare no competing interests.

Shinya Tsuzuki
stsuzuki@hosp.ncgm.go.jp

AMR Clinical Reference Center, National Center for Global Health and Medicine, Tokyo 162-8655, Japan

- O'Brien KS, Emerson P, Hooper PJ, et al. Antimicrobial resistance following mass azithromycin distribution for trachoma: a systematic review. *Lancet Infect Dis* 2019; **19**: e14–25.
- Ministry of Health Labour and Welfare Japan. Japan Nosocomial Infections Surveillance (JANIS). Ministry of Health Labour and Welfare Japan, 2017. https://janis.mhlw.go.jp/report/open_report/2017/3/1/ken_Open_Report_201700.pdf (accessed Jan 14, 2019).
- Randel A. IDSA updates guideline for managing group A streptococcal pharyngitis. *Am Fam Physician* 2013; **88**: 338–40.
- AMR Clinical Reference Center. Trends in parenteral antimicrobial consumption calculated from the sales data, Japan [Antimicrobials for humans]. Nippon AMR One Health Report (NAOR), 2017. <https://amr-onehealth.ncgm.go.jp/en/statistics/5787/> (accessed Jan 14, 2019).
- European Center for Disease Prevention and Control. Surveillance of antimicrobial consumption in Europe, 2013–2014. Stockholm: European Center for Disease Prevention and Control, 2014.

Kosovo's national action plan for antimicrobial resistance

Antimicrobial resistance is one of the major public health challenges worldwide.¹ Antibiotic consumption and related resistance are increasing around the globe, particularly in developing countries. Kosovo is located in southeast Europe and has a population of 1.7 million inhabitants. The main challenges regarding antimicrobial resistance in Kosovo are limited financial and human resources, over-the-counter sale of antibiotics, and scarcity of clinical guidelines authorised by the Ministry of Health. The prevalence of antimicrobial resistance in Kosovo is two to five times higher for the majority of bacteria and

corresponding antibiotic groups compared with the means in EU countries.²

To address the challenge of antimicrobial resistance, the Ministry of Health has initially completed the National Strategy and Action Plan to Combat Antimicrobial Resistance 2011–15. Surveillance of antibiotic consumption was one of the main success stories during the implementation of the first strategy for antimicrobial resistance. Wholesalers' data suggest that antibacterial use in Kosovo in 2011 was 26.3 defined daily doses per 1000 inhabitants per day.³ However, the latest WHO publication on antibiotic consumption in Europe showed a substantial decrease in antibiotic consumption by almost 25%.⁴

In all seven hospitals in Kosovo, 56.8% of inpatients were using at least one antibiotic with ceftriaxone as the most prescribed antibiotic. At the primary care level, antibiotic therapy prescription with generic names was noted only in 31% of cases and the most prescribed antibiotic was also ceftriaxone.

No systematic monitoring of antibiotic consumption in the veterinary sector has been implemented. Kosovo participated in global surveillance of antimicrobial resistance from sewage in capital cities of Europe. The most common antimicrobial resistance genes identified in sewage of the capital city, Prishtina, were *msr(E)*, *blaOXA*, and *aaDa*.

On Dec 5, 2018, the Minister of Health signed a new National Action Plan for Antimicrobial Resistance for a period of 3 years. This plan aims to establish the framework of measures and interventions to limit the emergence and spread of antimicrobial resistance in our country. Planned activities of the action plan are in line with the WHO Global Action Plan for Antimicrobial Resistance⁵ and Council of Europe Conclusions on

Antimicrobial Resistance.⁶ This action plan has five strategic objectives and 47 activities. The cornerstone of this action plan will be antimicrobial stewardship and the One Health approach.

Specific objectives of the action plan for antimicrobial resistance are to strengthen intersectoral coordination; empower awareness, education, and training of the population and health-care workers; improve the monitoring capacity; optimise the use of antibiotics in human and veterinary medicine; reduce infections; and promote research and international co-operation.

We declare no competing interests.

*Lul Raka, Arsim Kurti, Arianit Jakupi, Shaip Krasniqi, Arbëresha Turjaka
lul.raka@uni-pr.edu

Faculty of Medicine (LR) and Department of Pharmacology (SK), University of Prishtina, Prishtina, Kosovo; Department of Microbiology, National Institute of Public Health of Kosovo, Prishtina, Kosovo (LR, AK); Chamber of Pharmacists of Kosovo, Prishtina, Kosovo (AJ); University for Business and Technology-Higher Education Institution, Prishtina, Kosovo (AJ); and Ministry of Health, Kosovo Government, Prishtina, Kosovo (AT)

- Laxminarayan R, Duse A, Wattal C, et al. Antibiotic resistance—the need for global solutions. *Lancet Infect Dis* 2013; **13**: 1057–98.
- WHO. Central Asian and eastern European surveillance of antimicrobial resistance: annual report 2017. Copenhagen: World Health Organization Regional Office for Europe, 2017.
- Versporten A, Bolokhovets G, Ghazaryan L, et al. Antibiotic use in eastern Europe: a cross-national database study in coordination with the WHO Regional Office for Europe. *Lancet Infect Dis* 2014; **14**: 381–87.
- WHO. WHO report on surveillance of antibiotic consumption: 2016–2018 early implementation. Geneva: World Health Organization, 2018.
- WHO. Global action plan on antimicrobial resistance. Geneva: World Health Organization, 2016. https://www.who.int/drugresistance/global_action_plan/en/ (accessed Dec 24, 2018).
- European Council. Council conclusions on the next steps under a One Health approach to combat antimicrobial resistance. Brussels: European Union, June 17, 2016. <https://www.consilium.europa.eu/en/press/press-releases/2016/06/17-epsco-conclusions-antimicrobial-resistance> (accessed Dec 24, 2018).