

Combating antimicrobial resistance during the COVID-19 pandemic

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Global attention has been drawn to combat coronavirus disease 2019 (COVID-19), draining tremendous government resources, political commitment, public health measures, manpower of healthcare professionals, media, and public interest. The COVID-19 has also seriously affected the global effort against antimicrobial resistance (AMR). According to a survey conducted in late 2020 by the World Health Organization (WHO) AMR Surveillance and Quality Assessment Collaborating Centres Network, 63% (35 out of 56 countries) reported an increase in total prescriptions of antibiotics, with 47% (23/49), 57% (27/47), and 40% (18/45) of countries reporting increased use of WHO Access, Watch, and Reserve antibiotics, respectively.¹ More importantly, 37% (13/35) and 40% (12/30) of countries reported an increase in multidrug-resistant organism (MDRO) healthcare-associated infections and MDRO infections in long-term care facilities, respectively. Outbreaks and increases in AMR acquisition, such as carbapenemase-producing Enterobacteriaceae, have also been reported by hospitals during the COVID-19 pandemic.^{2–4}

The situation of MDRO in Hong Kong is worrisome. The Hospital Authority has reported a higher rate of methicillin-resistant *Staphylococcus aureus* bacteraemia detected after 48 hours of admission in 2020 and the first half of 2021, compared with that of previous years, although this may be due to a reduction in hospital admission of milder cases.⁵ An outbreak of *Candida auris*, an often highly resistant emerging infection, during the third wave of the COVID-19 pandemic is also concerning. From 29 June 2020 to 9 October 2020, the Hospital Authority reported 41 patients with *Candida auris* colonisation to the Infection Control Branch of the Centre for Health Protection for infection control advice after discharge to residential care homes.⁶ The number of cases of carbapenem-resistant Enterobacteriaceae discharged to residential care homes for the elderly rose from 242 cases in 2019 to 259 cases in 2020, and then sharply to 329 cases between January and August 2021.

The COVID-19 pandemic has affected antimicrobial stewardship activities and driven

AMR in various ways. Drifting of resources, including laboratory capacity, reduced reagents and consumables, physician and nursing manpower, and public health staff, have undermined antimicrobial stewardship programmes in many countries. Weakened infection control due to fatigue and heavy workload of healthcare workers, and shortages of personal protective equipment in the early days of the pandemic further aggravated the problem. Hospital admission may increase the risk of healthcare-associated infections and the transmission of MDROs, which in turn may lead to increased antimicrobial use. Disruption to routine immunisation activities, due to COVID-19-related measures, has led to reductions in overall vaccination coverage globally, potentially leading to an overuse of antimicrobials.^{7–9} Low-level exposure to biocidal agents can strengthen drug-resistant strains and enhance the risk of cross-resistance to antibiotics, particularly those that treat Gram-negative bacteria.¹⁰

Another important impact of COVID-19 on increasing AMR is secondary bacterial infection among patients with COVID-19. Empirical treatment of patients with COVID-19 using antibiotics is common. A meta-analysis involving 154 studies and over 30 000 patients revealed that 74.6% of patients with COVID-19 received antibiotics, significantly higher than the estimated prevalence of bacterial co-infection.¹¹ This is echoed by another review of studies published on hospitalised patients with COVID-19, which revealed 72% (1450/2010) of patients received antibiotics but only 8% (62/806) had bacterial or fungal co-infections.¹² The most common type of secondary infection of COVID-19 was pneumonia (especially ventilator-associated pneumonia), followed by bloodstream and urinary tract infections, and the most commonly used agents included fluoroquinolones, cephalosporins, carbapenems, azithromycin, vancomycin, and linezolid.^{13,14} Those with complications of COVID-19 may require mechanical ventilation or other invasive devices, which increases the risk of acquiring hospital-associated pathogens that are often highly resistant, such as methicillin-resistant

Staphylococcus aureus, *Pseudomonas aeruginosa*, and *Acinetobacter baumannii*.¹⁵

Despite the challenges posed to AMR, the COVID-19 pandemic also creates some opportunities, such as enhanced infection control measures among healthcare workers and the high alertness of personal hygiene among the general public. These measures, which include cough etiquette, hand hygiene, wearing of masks, and social distancing, have helped to reduce various infections, in particular those caused by respiratory pathogens.¹⁶⁻¹⁸ In addition, increased fear of attending healthcare facilities and postponement of elective hospital procedures have resulted in fewer medical consultations and antibiotic prescriptions. Surveillance data on wholesale antimicrobial consumption in Hong Kong show a substantial reduction (28.3%) in daily defined doses of antimicrobials from 19.02 million in 2019 to 13.63 million in 2020. In particular, there were major reductions (of between 35.3% and 51.5%) in wholesale supply to general practitioners of amoxicillin with or without beta-lactamase inhibitor, azithromycin, and cefuroxime, which are commonly prescribed to manage upper and lower respiratory tract infections. In Hong Kong, social distancing measures imposed by public health authorities, school and kindergarten closures, work-from-home policies, other restrictions involving catering businesses and scheduled premises such as fitness centres, beauty salons, karaoke establishments and sport centres, have all helped limit transmission through the respiratory route and person-to-person contact of not only COVID-19 but also other infections. Enhanced environmental hygiene using diluted household bleach containing 5.25% sodium hypochlorite can kill severe acute respiratory syndrome coronavirus 2 and other pathogens including MDROs.

Although more research is needed to dissect the intermingled relationship between COVID-19 and AMR, it is of utmost importance to maintain efforts against AMR. The theme for World Antibiotic Awareness Week, held on 18 to 24 November 2021, was “Spread Awareness, Stop Resistance”. The dedicated page on the Centre for Health Protection website (<https://www.chp.gov.hk/en/features/47850.html>) includes access to the latest IMPACT (Interhospital Multi-disciplinary Programme on Antimicrobial ChemoTherapy) guideline, an evidence-based clinical guideline to ensure that patients receive the right antibiotic, at the right dose, at the right time, and for the right duration that leads to the best clinical outcome for the treatment or prevention of infection while producing low risk for subsequent resistance. The website also allows access to patient education and publicity materials on AMR. Similar to COVID-19, AMR is a complex

global priority and everyone has a role to play.

Author contributions

All authors contributed to the editorial, approved the final version for publication, and take responsibility for its accuracy and integrity.

Conflicts of interest

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