Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Ethics, Medicine and Public Health 19 (2021) 100704

Available online at
ScienceDirect
www.sciencedirect.com

Elsevier Masson France
EM|consulte
www.em-consulte.com/en

LETTER TO THE EDITOR

Dengue, measles, and COVID-19: A threefold challenge to public health security in Pakistan

Keywords COVID-19; Dengue; Measles; Pakistan; Triple-outbreak

Dear Editor,

Since 2010, Pakistan has been scourged by yearly dengue epidemics that peak in post-monsoon period. Despite control efforts effectuated in collaboration with WHO, 47,120 cases of dengue were confirmed in 2019 [1]. A few months later, on 26th of February, 2020, Pakistan reported its first case of COVID-19. The country's third wave of COVID-19 peaked in March—April 2021, bringing the national tally to 941,170 cases and 21,689 deaths as of 14 June 2021 [2]. Concomitantly, a third plague is further stretching the nation's limited resources, with 1550 cases of measles being identified country-wide since the beginning of 2021 [3].

A high population density, low literacy rate, underfunded and understaffed healthcare infrastructure, and limited accessibility to health services and health teams particularly in remote areas contribute to inadequate infection control practices in Pakistan. The 2018—19 Economic Survey reported a total of 1279 hospitals in the country, and a doctor patient ratio of 1:1300 which surpasses the WHO recommended ratio of 1:1000 [4]. The ratio is bound to increase further with multiple disease outbreaks infecting a rising number of patients and the high mortality being recorded among healthcare workers due to shortage of personal protective equipment since the onset of COVID-19 pandemic.

With a temperate and humid climate, Pakistan's geographical location is conducive to the breeding of *Aedes egypti*, the mosquito vector for dengue [5]. Given such favourable environmental conditions, disease surveillance should be a priority for infectious disease and public health experts. However, Pakistan's dengue crisis may be propelled further corresponding to an alarming trend being observed in many countries with a high burden of infectious tropical diseases such as Brazil and India, which depicts the inefficiency of reporting systems to detect and prevent new cases of viral haemorrhagic fevers due to the similarities in their clinical presentation to COVID-19, and the reallocation of resources, efforts and personnel in curbing COVID-19 epidemics [6—10].

Likewise, measles also shows an increased incidence in temperate zones with a seasonal variation, flaring in late winter and early spring [11]. Although evidence regarding the impact of climate on COVID-19 outbreak is ambiguous, multiple studies have shown that climatic conditions like temperature, humidity, and radiation could play a secondary role in disease transmission [12]. Apart from its natural propensity, a growing number of displaced and refugee populations coupled with a lack of travel restriction and airport screening policies for people coming from endemic areas inevitably makes Pakistan an easy target for many infectious pathogens.

Since primary prevention is imperative in eliminating infectious diseases, immunization has remained the central focus of all national control strategies. Although live attenuated vaccines are available for dengue, Pakistan has not started any vaccination programs yet [13]. The first and second vaccine doses for measles were added in the Expanded Program of Immunization in 1974 and 2009 respectively, but their respective coverage at 76% and 45% of population in 2017 was considerably below the WHO recommended coverage of 95% [14]. Similarly, the COVID-19 vaccination drive in Pakistan, after its launch on 3 February 2021, is crawling along, with only 1.2% of the population fully vaccinated as of 9 June 2021 [15].

Multiple factors hamper the rate of immunization in Pakistan, including socioeconomic limitations, and increasing vaccine hesitancy among the masses, which persists despite ongoing media campaigns to eliminate myths and uncertainties regarding vaccination. Poverty, cultural beliefs, and lack of access to health services and technology are major reasons for vaccine refusals and the subsequent failure of immunization programs in Pakistan [16]. As in many African countries that identified a significant drop in routine immunization which contributed to the spread of yellow fever epidemic in the continent [10], the COVID-19 pandemic has had a similar impact on immunization services in Pakistan leading to a 52.5% decline in daily average total vaccines administered compared to baseline, due to lockdowns and fear of exposure to COVID-19 in health facilities interrupting immunization centre visits [17].

To successfully combat this triple-outbreak, focused interventions such as stringent vector control measures, active testing and contact tracing, airport screening of travellers for early isolation of cases, affordable, rapid and accurate diagnostic kits, and awareness campaigns catering to at-risk and displaced communities are crucial. Increased federal investment in public health sector is mandatory to expand immunization coverage by establishing accessible vaccination centres even in remote areas, competing in the global market to procure sufficient supplies, and expediting vaccine deliveries. Lastly, but importantly, inculcating a civic sense of responsibility in the masses to adhere to

government guidelines and standard operating procedures is essential to prevent the crises from spiralling out of control.

The combined toll of three lethal viruses is bound to push Pakistan's creaky healthcare and socioeconomic system to the brink of collapse. A collaborative and comprehensive approach to coordinate a timely response through long-term, sustainable strategies is the need of the hour. There is an urgent need for authorities to address the shortcomings in our national control programs, notably the challenges to testing and immunization coverage. Building a resilient public health system through adequate resource allocation is equally vital to respond proactively to the current outbreaks, while predicting new threats.

Human and animal rights

The authors declare that the work described has not involved experimentation on humans or animals.

Informed consent and patient details

The authors declare that the work described does not involve patients or volunteers.

Funding

This work did not receive any grant from funding agencies in the public, commercial, or not-for-profit sectors.

Author contributions

All authors have contributed, read and approved the final manuscript.

Disclosure of interest

The authors declare that they have no competing interest.

References

[1] World Health Organization (WHO). Dengue fever — Pakistan; 2019 https://www.who.int/csr/don/19-november-2019-dengue-pakistan/en/.
[2] WHO. Coronavirus (COVID-19) dashboard with vaccination data, (n.d.). https://covid19.who.int/region/emro/country/pk [accessed June 14, 2021].
[3] National Institute of Health (NIH) Islamabad. Weekly field epidemiology report; 2021 [accessed June 14, 2021] https://www.nih.org.pk/wp-content/uploads/2021/04/15-FELTP-Pakistan-Weekly-Epidemiological-Report-Apr-04-10-2021.pdf.
[4] Ministry of Finance. Government of Pakistan, (n.d.). http://www.finance.gov.pk/survey_1819.html [accessed June 14, 2021].
[5] Khan J, Khan I, Ghaffar A, Khalid B. Epidemiological trends and risk factors associated with dengue disease in Pakistan (1980—2014): a systematic literature search and analysis. BMC Public Health 2018;18:1—13, http://dx.doi.org/10.1186/s12889-018-5676-2.
[6] Phadke R, Mohan A, Çavdaroğlu S, Dapke K, dos S Costa AC, Riaz MMA, et al. Dengue amidst COVID-19 in India: the mystery of plummeting cases. J MedVirol 2021;93:4120—1, http://dx.doi.org/10.1002/jmv.26987.
[7] Rabiu AT, Mohan A, Çavdaroğlu S, Xenophontos E, Costa ACS, Tsagkaris C, et al. Dengue and COVID-19: a double burden to Brazil. J Med Virol 2021;93:4092—3, http://dx.doi.org/10.1002/jmv.26955.
[8] dos S, Costa AC, Hasan MM, Xenophontos E, Mohanan P, Bassey EE, et al. COVID-19 and Zika: an emerging dilemma for Brazil. J Med Virol 2021;93:4124—6, http://dx.doi.org/10.1002/jmv.27006.
[9] Christopher I, Rocha N, Mehedi Hasan M, Goyal S, Patel T, Jain S, et al. COVID-19 and mucormycosis syndemic: double health threat to a collapsing healthcare system in India. Trop Med Int Health 2021, http://dx.doi.org/10.1111/tmi.13641.
[10] Çavdaroğlu S, Hasan MM, Mohan A, Xenophontos E, dos S Costa AC, Aborode AT, et al. The spread of Yellow fever amidst the COVID-19 pandemic in Africa and the ongoing efforts to mitigate it. J Med Virol 2021, http://dx.doi.org/10.1002/jmv.27027.
[11] Yang Q, Fu C, Wang N, Dong Z, Hu W, Wang M. The effects of weather conditions on measles incidence in Guangzhou, Southern China. Hum Vaccines Immunother 2014;10:1104—10, http://dx.doi.org/10.4161/hv.27826.
[12] Briz-Redón Á, Serrano-Aroca Á. The effect of climate on the spread of the COVID-19 pandemic: a review of findings, and statistical and modelling techniques. Prog Phys Geogr 2020;44:591—604, http://dx.doi.org/10.1177/0309133320946302.
[13] Yousaf MZ, Siddique A, Ashfaq UA, Ali M. Scenario of dengue infection & its control in Pakistan: an up-date and way forward. Asian Pac J Trop Med 2018;11:15—23, http://dx.doi.org/10.4103/1995-7645.223529.
[14] Mere MO, Goodson JL, Chandio AK, Rana MS, Hasan Q, Teleb N, et al. Progress Toward Measles Elimination — Pakistan, 2000—2018. MMWR Morb Mortal Wkly Rep 2019;68:505—10, http://dx.doi.org/10.15585/mmwr.mm6822a4.
[15] Coronavirus (COVID-19) Vaccinations — Statistics and research — Our world in data, (n.d.). https://ourworldindata.org/covid-vaccinations?country=PAK https://covid19.who.int/region/emro/country/pk [accessed June 14, 2021].
[16] Khattak FA, Rehman K, Shahzad M, Arif N, Ullah N, Kibria Z, et al. Prevalence of Parental refusal rate and its associated factors in routine immunization by using WHO Vaccine Hesitancy tool: a cross-sectional study at district Bannu, KP, Pakistan. Int J Infect Dis 2021;104:117—24, http://dx.doi.org/10.1016/j.ijid.2020.12.029.
[17] Chandir S, Siddiqi DA, Mehmood M, Setayesh H, Siddique M, Mirza A, et al. Impact of COVID-19 pandemic response on uptake of routine immunizations in Sindh, Pakistan: an analysis of provincial electronic immunization registry data. Vaccine 2020;38:7146—55, http://dx.doi.org/10.1016/j.vaccine.2020.08.019.

A. Yousaf [a], F.M.A. Khan [b], M.M. Hasan [c,d,*], I. Ullah [e], M. Bardhan [f]

[a] *Quaid-e-Azam Medical College, Bahawalpur, Pakistan*

[b] *Dow University of Health Sciences, Karachi, Pakistan*
[c] *Department of Biochemistry and Molecular Biology, Faculty of Life Science, Mawlana Bhashani Science and Technology University, Tangail, 1902, Bangladesh*
[d] *Division of Infectious Diseases, The Red-Green Research Centre, BICCB, Dhaka, Bangladesh*
[e] *Kabir Medical College, Gandhara University, Peshawar, Pakistan*
[f] *Department of Neurology, National Institute of Mental Health and Neurosciences (NIMHANS), Bengaluru, India*

[*] Corresponding author at: Department of Biochemistry and Molecular Biology, Faculty of Life Science, Mawlana Bhashani Science and Technology University, Tangail 1902, Bangladesh.
E-mail address: mehedi.bmb.mbstu@gmail.com (M.M. Hasan)

Available online 2 July 2021

Received 19 June 2021; accepted 28 June 2021

https://doi.org/10.1016/j.jemep.2021.100704