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Editorial

COVID-19 pandemic: Current & future perspectives

Growing risk of pandemics in future

We live in a world where on an average three novel or re-emergent pathogens have appeared every year since 1980 (almost 75 % of these being viruses)[1]. Six public health emergencies of international concern have been declared by the World Health Organization (WHO) during the first two decades of the current millennium[2]. Reasons contributing to this are the encroachment into wildlife where more than 20,000 coronaviruses are lurking[3], increased land-use change to meet the essential needs and demands of the growing population, national investment in public health remaining static and thus capacities enunciated in the International Health Regulations (2005)[4] being widely unmet. Though awareness of One Health approach has grown, its implementation is yet to take off. In addition, the world is experiencing changes in climate, population, food systems and supply chain. Some of these changes are conducive to the eruption of novel disease outbreaks at the local level and, if not contained, can explode into epidemics or pandemics affecting human development much more than what COVID-19 pandemic has done[5].

Nationalism versus global health security

The illusion of resource-starved countries getting timely support from the developed world during health emergencies has been shattered during the COVID-19 pandemic where nationalism superseded effective and needed global response. The discrimination between rich and poor countries in having access to public health tools, especially vaccines, has been appalling. According to the WHO Director-General, while 58 countries have achieved or exceeded the target of vaccinating 70 per cent of their population against COVID-19, the coverage has been abysmally low at 13 per cent in the low-income countries[6]. The WHO has been recommending equitable distribution of vaccines across the world with the objective of vaccinating entire population of the elderly and healthcare workers and building protection against COVID-19 in 70 per cent of global population[6].

It is obvious that an overwhelming number of 20 million lives saved through vaccination against COVID-19 have been in the developed world[7]. In the context of global health emergency, this is a glaring example of unacceptable inequity.

The pandemic continues

According to the WHO, as of June 30, 2022, there have been 543,352,927 confirmed cases of COVID-19, including 6,331,059 deaths. On June 28, 2022 alone, 827,735 new cases were reported[8]. During the same period, India reported a cumulative of 43.4 million cases with estimated 525,000 deaths due to COVID-19[9].

The COVID-19 pandemic is currently being driven by several lineages and sub-lineages of the Omicron variant of concern. The pandemic is not over yet. Cases are increasing in 110 countries. In many countries in spite of weak pathogenicity of the currently prevalent virus strains, deaths have risen[6]. Despite global utilization of more than 12 billion doses of vaccines, millions of people including innumerable healthcare and frontline workers remain unvaccinated. Only 58 countries have achieved the target set by the WHO of vaccinating 70 per cent of their eligible population[6].

Socio-economic impact of pandemic

There has been enormous economic impact of COVID-19. The United Nations has estimated that this pandemic has slashed global economic output by US$ 8.5 trillion during the two years of pandemic[10]. Apart from economic loss, COVID-19 crisis has pushed global unemployment over the 200 million mark by 2022[11].

Pandemics are usually measured by the mortality, morbidity and economic loss they cause. Social aspects

are usually ignored despite their severe physical, emotional and psychological implications. Education of children and skill acquisition by adults suffered tremendously during the pandemic. Prolonged anxiety, pain, insomnia, distress, *etc*. have been reported in various countries[12,13]. Despite all, mental health issues remain unrecognized because of individual's efforts to avoid associated stigma. Unfortunately, health sector has been according low priority to this far-reaching consequence of pandemic[14]. Even an increase in suicides has been observed during the lockdown periods in urban slums in India because of multiple pandemic-linked factors[15].

Governance and finance

Carefully designed and implemented health financing policies are necessary to ensure uninterrupted flow of funds to support outbreak preparedness and response. Ensuring sustained financing is a challenge facing policymakers in an increasingly complex political environment with limited resources and several competing priorities. Nevertheless, the impact of pandemic on all walks of life and human development as unequivocally demonstrated by COVID-19 pandemic must convince the leadership to accord top priority to continuous preparedness against unpredictable future health emergencies with devastating effects. It is also imperative to move from narrow initial investments in infectious disease epidemiology to deeper integration with health systems strengthening, universal health coverage and multisectoral disaster risk reduction measures[16].

The next pandemic warrants maintaining a state of preparedness through a comprehensive and coordinated strategy. This involves planning an encompassing skilled human resource, infrastructure, surge capacity and adequate sustained funding to mount a swift response as soon as outbreak occurs. Guidelines from the WHO are available on pandemic preparedness plans[17].

The national authorities must accord highest priority to preparedness against any future pandemic. Such public health emergencies must be considered as serious national and global security threats and invested accordingly. A comprehensive national assessment is a prerequisite to understand gaps in the implementation of appropriate remedial measures. If required, an independent external review may be commissioned using globally accepted tools[18]. A whole-of-society approach to pandemic preparedness emphasizes the significant roles played not only by the health sector but also by other sectors (especially the animal and wildlife sectors), individuals, families and communities, in mitigating the effects of a pandemic[17].

Components of pandemic preparedness

Essentially pandemic preparedness comprises prevention, detection and response and an in-built capacity to scale these up as and when needed. Countries should build interoperable and cohesive capacity within the overall ambit of the health system and through assiduous application of One Health approach to connect, collaborate and coordinate across sectors.

Surveillance: Strong surveillance keeps a close and consistent watch on the diseases that threaten communities. Modern information technology-powered tools including artificial intelligence and machine learning can widen the spectrum of surveillance and also undertake data analyses in almost real time to facilitate early and effective public health actions[19].

With improved and robust surveillance systems, unusual warning signals can be detected and reported earlier; trends can be monitored and analyzed for meaningful response through prompt public health decisions, with the objective of preventing outbreaks and their amplification.

Laboratories: Efficient, high-quality laboratories ensure rapid and reliable diagnosis, detection, tracking, characterization and recording of pathogens for a complete picture of disease burden. With laboratory technologies including polymerase chain reaction and whole-genome sequencing not restricted to health sector laboratories, it is prudent as has been shown by India during COVID-19 pandemic[20] to harness services available in animal health, industrial research, defence, biotechnology, academia and private sector in providing diagnostic and allied services. Of the 3382 COVID-19 diagnostic laboratories in India, as of June 30, 2022, 1945 were from the private sector[20], an exquisite example of effective public–private partnership.

Genomic characterization of viruses and their sharing in real time accelerates the establishment of specific diagnosis and also throws light on evolution and spread of the pathogen, thus contributing to surveillance[21]. These technologies are of immense use in future development of therapeutics and vaccines.

Data-driven decisions: Informed decisions that are cost-effective and efficient need to be made in health emergencies. These are the products of integrated data management data drawn from surveillance observations and diagnostic patterns in real time, highlighting areas requiring immediate attention. This information should flow throughout the health system and rapidly trigger a response[22].

Infrastructure and logistics: Appropriate infrastructure, strong logistics support and supply chain management contribute significantly to execution of response plan and mitigating impact of health emergencies[23,24].

Research: Pandemics provide unprecedented opportunities and natural scenarios to undertake basic, operational and translational research. Apprehensions about impending pandemic should also stimulate research on factors that influence emergence of new pathogens and their sudden explosion into pandemic. Onset of pandemic can build upon existing tools and science if the infrastructure, expertise and intersectoral collaborations are in place.

COVID-19 pandemic showed that the global scientific community is competent to rapidly develop and deploy new interventions in epidemiology, designing and development of diagnostics, therapeutics and vaccines. The WHO Solidarity and Solidarity Plus trials[25] brought together global research communities to generate unequivocal evidence on the utility of several potential antiviral drugs. This obviated misuse of ineffective antibacterial and antiviral drugs. Rampant and indiscriminate use of antibiotics in patients with COVID-19 has the potential of promoting antimicrobial resistance[26]. The greatest scientific achievement with far-reaching implications for possible replication for other pathogens was designing platforms and engineering antigens for the production of safe and potent COVID-19 vaccines[27]. COVID-19 mRNA vaccine platforms and technologies are now being utilized for making vaccines against HIV and other infections[28]. A new era in vaccinology has been heralded that can deliver quality vaccines in a much shorter period than hitherto experienced. However, further research is needed to develop second-generation vaccines as well as tests and treatments. The quest for a pan-coronavirus vaccine that covers all the variants so far must continue.

Community participation, communication and behavioural change

Active cooperation of communities is critical for the success of any health programme and response to health emergencies[29]. Myths and misgivings are always rampant during any crisis. Behavioural change is key to active participation of people[30]. Engagement of communities requires a professional, sustained and strategic approach using modern communication tools including prudent use of social media. COVID-19 pandemic showed challenges and barriers to vaccinating communities even in urban areas. Role of community-based organizations and groups is invaluable in conveying appropriate messages to the general public[31].

Conclusion and way forward

COVID-19 pandemic has taught us numerous lessons. The world needs to work together to prevent or minimize the health, social, economic and psychological impact of such public health emergencies. The global community needs to be reminded that COVID-19 pandemic is not the last of pandemics. Next pandemic is inevitable. Given the plethora of conducive factors, health emergencies will continue to occur with greater frequency. Some of the factors that continue to persist include potential of interspecies transfer, land usage alterations, invasion into wild life, altering the environment and interposing into an environment containing pathogens unfamiliar to humans and the inadequate surveillance by human, animal, environment and wildlife sectors compounded by weak health system.

The solution is to maintain a steady state of preparedness and capacity in accordance with the International Health Regulation (2005)[4] and augment community awareness. One Health approach is critical. One Health is no longer a concept. It is also not only an approach. It is a critical and overarching philosophy. It has to be adapted as a way of collective national response to health issues. Six Cs that characterize One Health, *viz*., commitment, capacity, co-ordination, cooperation, collaboration and communication across the sectors as a part of whole-of-society need to be translated into practice and ingrained into our systems in human health, animal and environment sectors through implementation of national framework[32], with focus on strong surveillance systems, global access to diagnostics, availability of safe and effective vaccines and therapeutics through strong systems, well-funded programmes and political commitment.

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