Systematic Review

Training Medical Students in Pandemic Preparedness: A Systematic Review

Abstract

Each of the global pandemics to date has left a permanent mark on the general population and significantly impacted the public health standards and human civilization. The purpose of the current review is to explore the significance of pandemic preparedness, identify the role of medical education in improving the same, enlist the potential challenges in the implementation of pandemic preparedness, and enlist the potential solutions to overcome the same. A search of all materials related to the topic was carried out on the PubMed and Google Scholar search engines, and a total of 27 articles were selected based on their suitability with the current review objectives and analyzed. Keywords used in the search include pandemic preparedness in the title alone only (namely, pandemic preparedness [ti] AND medical education [ti]; pandemic preparedness [ti] AND curricula [ti] OR curriculum [ti]; pandemic preparedness [ti] AND COVID-19 [ti]; pandemic preparedness [ti] AND health [ti]; and pandemic preparedness [ti]). Medical education plays an instrumental role in creating a team of skilled and competent health-care workforce, which becomes crucial to minimize the impact of pandemics on individuals, communities, and the health-care delivery system. As medical educators plan to deliver pandemic preparedness education in medical schools, we are expected to encounter different challenges. In conclusion, the training imparted to medical students on pandemic preparedness is crucial in the making of a resilient and adaptable health workforce. To reduce the magnitude of future pandemics, it is the need of the hour to identify the prevailing gaps/barriers and address them proactively to safeguard public health during pandemics.

Keywords: *Curriculum, health, medical education, pandemic preparedness*

Introduction

Each of the global pandemics to date has left a permanent mark on the general population and significantly impacted the public health standards and human civilization.[1] Pandemics have always exposed the existing weaknesses in the public health infrastructure, which has compelled authorities to invest more in the health sector to be better prepared for future health emergencies.[1,2] There has been a remarkable impact on communities owing to disruptions in financial structures, massive population movement, and cultural norms.[3] On a positive note, these pandemics have resulted in significant research and development activities accounting for better diagnostics and management of the disease.[2,3] Further, these pandemics have made global leaders work in collaboration in the domain of resource sharing, financial support, promotion of research activities, etc., thereby mounting a coordinated response to mitigate the impact of the disease.[1,2,4] Finally, the successful containment of these pandemics essentially depends on public awareness and their actions to support governmental policies.[1,2]

Like other sectors, pandemics tend to significantly influence the delivery of medical education as well.[1] In fact, most of the pandemics have impacted the domain of teaching–learning as well as assessment.[1,2] For instance, the emergence of the COVID-19 pandemic compelled the administrators to promote social distancing and discontinue all forms of physical training for medical students. Thus, all educators resorted to online modes of teaching–learning, but then still we fell short in doing clinical teaching, as it was difficult to simulate psychomotor and affective forms of clinical teaching.[1-3] The purpose of the current review is to explore the significance of pandemic preparedness, identify the role of medical education in improving the same, enlist the potential challenges in the implementation of pandemic preparedness, and enlist the potential solutions to overcome the same.

How to cite this article: Shrivastava SR, Bobhate PS, Mendhe HG, Badge A. Training medical students in pandemic preparedness: A systematic review. Asian J Soc Health Behav 2024;7:55-9.

Saurabh RamBihariLal Shrivastava[1,2], Prateek Sudhakar Bobhate[3], Harshal G Mendhe[2], Ankit Badge[4]

[1]Deputy Director (Research and Development), Off Campus, Datta Meghe Institute of Higher Education and Research, [2]Department of Community Medicine, Datta Meghe Medical College, Datta Meghe Institute of Higher Education and Research, Wanadongri, Nagpur, Maharashtra, [3]Department of Community Medicine, All India Institute of Medical Sciences, Vijaypur, Jammu, [4]Department of Microbiology, Jawaharlal Nehru Medical College, Datta Meghe Institute of Higher Education and Research, Sawangi, Wardha, Maharashtra, India

Received: 17 January, 2024.
Revised: 26 March, 2024.
Accepted: 04 April, 2024.
Published: 28 May, 2024.

ORCID:
Shrivastava Saurabh RamBihariLal: https://orcid.org/0000-0001-6102-7475

Address for correspondence:
Dr. Saurabh RamBihariLal Shrivastava,
Professor, Department of Community Medicine, Datta Meghe Medical College, Off-Campus Centre of Datta Meghe Institute of Higher Education and Research, Hingna Road, Wanadongri, Nagpur - 441 110, Maharashtra, India.
E-mail: drshrishri2008@gmail.com

Access this article online

Website: www.healthandbehavior.com

DOI: 10.4103/shb.shb_25_24

Quick Response Code:

Methods

A search of all materials related to the topic was carried out on the PubMed and Google Scholar search engines. Relevant research articles focusing on pandemic preparedness published in the period 2010–2023 were included in the review. A total of 93 studies were identified initially, of which 66 were excluded (49 articles were excluded as they were not in alignment with the current objectives (namely, not related with the field of medical education, dealt with awareness about pandemic preparedness among teachers or students, or are related with forecasting of pandemic preparedness), 15 articles were excluded due to the unavailability of the complete version of the articles, and two articles were excluded as they were ahead of print). Overall, 27 articles were selected based on their suitability with the current review objectives and analyzed. Keywords used in the search include pandemic preparedness in the title alone only (namely, pandemic preparedness [ti] AND medical education [ti]; pandemic preparedness [ti] AND curricula [ti] OR curriculum [ti]; pandemic preparedness [ti] AND COVID-19 [ti]; pandemic preparedness [ti] AND health [ti]; pandemic preparedness [ti]). The articles published in only the English language were included in the review [Figure 1]. The first two authors reviewed the articles for their appropriateness independently and then arrived at a common consensus through discussion (in case of any conflict). The collected information is presented under the following subheadings, namely, the significance of pandemic preparedness, the role of medical education in mitigating the effects of pandemics, and identified challenges and potential solutions.

Results and Discussion

The results and discussion are presented under the following subheadings:

Significance of pandemic preparedness

This is not a hidden fact that a nation that is well equipped to deal with pandemics, can remarkably minimize the sufferings, and ensure the well-being of its populations.[5] As a matter of fact, pandemic preparedness can significantly maintain global health security by reducing the impact of infectious diseases on the global population.[6] Moreover, health systems that are well prepared can rapidly respond to emerging threats, which not only minimize the suffering but also even the quick transmission of infectious agents among susceptible population groups.[7,8] This accounts for better utilization of available resources and establishes a better trust of the general population in the health-care delivery systems, including a reduction in stress and anxiety that can be attributed to the causative agent.[9,10] Further, public health authorities get time to strengthen awareness and social mobilization activities by making people aware of the do's and don'ts for the effective prevention and control of the disease.[11] In continuation, communities that are well aware can be efficiently employed in mitigation activities, and thus there is a collective effort to reduce the impact of the infectious agent.[11-13]

Once we are prepared well to respond to pandemics, there is a kind of better collaboration between professionals from different disciplines (namely, medicine, public health, government, environment, transport, airways).[14,15] Further, we must understand that any efforts in the direction of pandemic preparedness automatically are based on investment and innovation in health-related technologies, diagnostics, and therapeutics, all of them contributing to the strengthening of research activities in the field of infectious diseases.[16,17] In continuation, many periodic activities are being organized for capacity building with a vision to create a team of skilled and competent health professionals who can manage complex health situations and ensure the

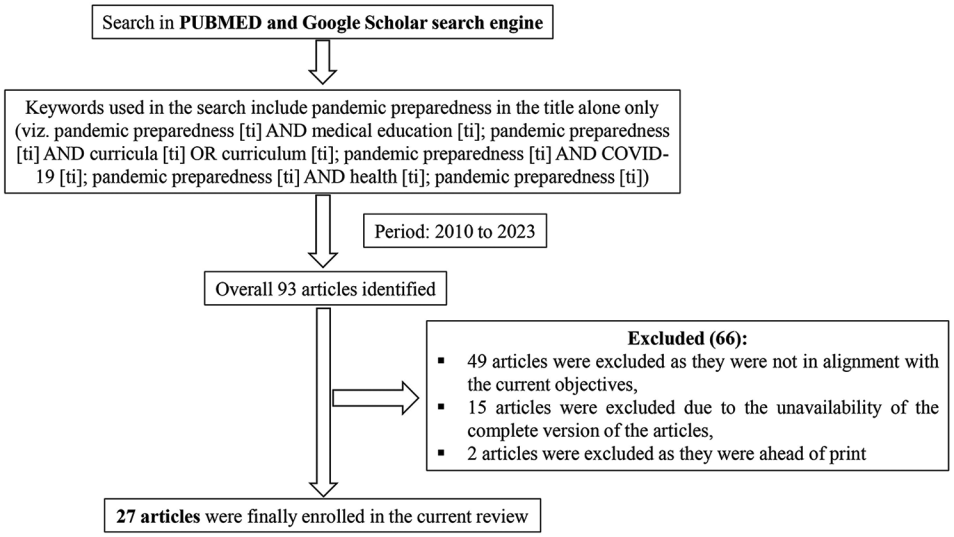

Figure 1: Flowchart for selection of research articles

delivery of effective patient care.[18,19] Preparedness efforts also are directed toward the development and distribution of vaccines across the world in an equitable manner, thereby reducing the spread of the infection.[20] Finally, owing to all these preparedness activities we can ensure that the impact of a pandemic on the economy and different sectors is limited.[2,4] Hence, pandemic preparedness is crucial for maintaining global health and promoting the resilience of the health sector and community.[9,11]

Role of medical education in mitigating the effects of pandemics

Medical education is expected to play an indispensable role in preparing future cohorts of health-care professionals who are competent and well equipped to effectively respond to pandemics.[21] To begin with, medical education ensures that medical students acquire the knowledge and skills needed to ensure early diagnosis and prompt treatment of emerging infections and implement measures for their containment.[22] Once medical students are trained in the principles of epidemiology, they can contribute to tracking the spread of disease, surveillance activities, and identification of potential outbreaks.[22,23] As these medical students realize the importance of prevention and control measures, they can create awareness about infection control measures, including the use of appropriate personal protective equipment both within and outside health-care facilities.[22-24] Further, owing to the training received in the domain of improvement in their communication skills, students can extend their support in creating awareness about the disease to people from different walks of life and dispel the myths and misconceptions pertaining to the pandemic.[23]

As medical students are pretty much aware that medical knowledge continues to change with each day, the same realization can be employed in the management of pandemics, herein the students are pretty much aware of the dynamic situations (namely, changing caseload, guidelines for detection or containment, management protocol) and thus are more flexible to adapt to these advancements.[21,24] Medical education exposes students to work as a member of health teams, including professionals from different disciplines, and considering that any pandemic is an extraordinary situation, we have to adopt a multipronged strategy involving support from different disciplines (namely, physicians, nursing staff, and epidemiologists) for the effective containment of the infection.[25] Further, medical education sensitizes students on the principles of resource allocation and management, and using this gained knowledge, health professionals can play their part in optimizing the use of available resources, which is even more crucial in low- and middle-income nations.[23,24] Adherence to ethical principles significantly helps health professionals in making any decision in the health sector, and the same principles need to be employed in pandemics to effectively implement resource allocation or triage protocol in a fair and transparent manner.[18]

Considering the importance of mental health in maintaining overall health, medical students are constantly exposed to this domain, and the same knowledge has been used to give priority to the mental well-being of both patients and health-care professionals (as all those who are working have to experience lots of emotional stress, physical stress, and mentally draining situations every day).[26] Technology has invaded the medical education/health sector as well, and to reach remote settings that might harbor huge populations of susceptible individuals, it becomes crucial to employ telemedicine to make health services accessible to everyone.[27,28] As medical education exposes students to leadership training, they are much better placed to demonstrate their leadership skills by mounting a coordinated response for the management of the pandemic. As education and research go hand-in-hand, the exposure to research domain during medical training can enhance student's competence to extend their support to develop vaccines, treatments, and diagnostic tools.[16,17] Medical education aims to prepare global doctors in such a way that the imparted training is good enough to produce doctors who are globally relevant.[29] This basic fundamental is often being employed to understand the connections between different aspects of pandemic containment, which in turn essentially requires global collaboration.[29,30] To summarize, medical education plays an instrumental role in creating a team of skilled and competent health-care workforce, which becomes crucial to minimize the impact of pandemics on individuals, communities, and the health-care delivery system.[18,21,24]

Identified challenges and potential solutions

As medical educators plan to deliver pandemic preparedness education in medical schools, we are expected to encounter different challenges as mentioned in Table 1.[18,21] These challenges can be broadly categorized into those pertaining to the curriculum, such as lack of standardized curricula, limited emphasis on public health in the medical curriculum, time constraints, and limited exposure to authentic scenarios.[18] Similarly, there are many challenges that are related to the faculty members, such as reluctance among faculty members and reduced competence levels.[21,22] Other challenges are pertaining to resources, such as outdated teaching materials, shortage of simulation resources, limited integration of technology, and other resource constraints.[6,23] Finally, we can also encounter concerns pertaining to the provision of minimal opportunities for interdisciplinary collaboration, complex ethical dilemmas, limited community engagement, etc.[18,23,29] There is an immense need to identify these challenges and address them in a collaborative manner

Table 1: Identified challenges and potential solutions

Identified challenges	Potential solutions
Limited emphasis on public health	Integrate public health modules into the medical curriculum, with due emphasis on the societal impact of infectious diseases
	Offer elective courses in pandemic preparedness for interested medical students
	Develop partnerships between medical colleges and public health institutions to provide more learning opportunities for students
Lack of standardized curriculum for pandemic preparedness	Formulate national or international guidelines for pandemic preparedness education (topics that need to be covered) to ensure uniformity
	Set accreditation standards that are specific to pandemic-related training
	Promote collaboration between teachers from different institutions to share their resources and best practices for pandemic preparedness
Time constraints	Identify pandemic preparedness topics and integrate them strategically across all phases of the curriculum
	Incorporate learning resource materials in learning management systems to enable learning beyond classroom hours
	Initiate elective courses to accommodate pandemic-related content
Questionable faculty expertise	Involve experienced mentors and use them to train existing staff in pandemic-related fields
	Encourage faculty members to pursue additional courses in infectious diseases and pandemic response
Faculty resistance to change	Sensitize faculty members about the scope and need to implement pandemic preparedness education
	Conduct training programs to empower faculty members to employ innovative teaching–learning methods to actively engage students
	Share success stories and the benefits that have been reported upon implementation of pandemic preparedness education in other medical schools
Resource constraints	Convince administrators about the need to invest and provide resources to ensure effective delivery of pandemic-preparedness education
	Prioritize resource allocation based on the specific needs of pandemic preparedness education
Outdated teaching materials	Regularly update and revise learning resource materials to cover different aspects of pandemic preparedness
	Give a platform for students to discuss with their peers and pool learning resources
	Encourage teachers to include recent case studies and novel disease outbreaks in lectures
Insufficient simulation resources	Develop virtual simulation programs to provide an opportunity for medical students to practice pandemic responses
	Collaborate with other institutions to pool simulation resources
Inadequate interdisciplinary collaboration	Initiate interdisciplinary courses or activities involving students from various health-care disciplines
	Encourage research work involving faculty and students from various specialties
Limited integration of technology	Promote investment in technology infrastructure to support online learning, virtual simulation, and other technology-enabled educational methods
	Organize faculty development programs to augment the competence of teachers to use technology for teaching-learning and assessment
	Explore the possibility of liaison with technology companies to come up with customized tools/platforms for pandemic preparedness education
Complex ethical dilemmas	Integrate ethics modules into pandemic preparedness education, focusing on the unique ethical challenges posed by infectious disease outbreaks
	Facilitate discussions and case-based learning to help students navigate complex ethical dilemmas
	Provide ongoing training for faculty on addressing ethical considerations in pandemic-related scenarios
Limited community engagement	Encourage teachers to adopt strategies for community engagement into the curriculum
	Establish partnerships with community leaders for collaborative educational initiatives

using a multisectoral approach involving different stakeholders.[18,23,30,31]

Limitations

The limitation of the current review is that we carried out a search across only two search engines and did not evaluate the articles for their quality.

Conclusion

The training imparted to medical students on pandemic preparedness is crucial in the making of a resilient and adaptable health workforce. To reduce the magnitude of future pandemics, it is the need of the hour to identify the prevailing gaps/barriers and address

them proactively to safeguard public health during pandemics.

Authors contributions

SRS contributed in the conception or design of the work and drafting of the work. PSB, HGM, AB contributed in the literature review and revision of the manuscript for important intellectual content. SRS, PSB, HGM, AB approved the final version of the manuscript, and agreed for all aspects of the work.

Data availability statement

The literature pertaining to the article can be made available at request by contacting Saurabh RamBihariLal Shrivastava at drshrishri2008@gmail.com on reasonable request.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

1. Hiscott J, Alexandridi M, Muscolini M, Tassone E, Palermo E, Soultsioti M, *et al.* The global impact of the coronavirus pandemic. Cytokine Growth Factor Rev 2020;53:1-9.
2. McCartney M. Medicine: Before COVID-19, and after. Lancet 2020;395:1248-9.
3. Peschanski N. Impact of the pandemic on emergency medicine and its future. Eur J Emerg Med 2022;29:85.
4. Gorain B, Choudhury H, Molugulu N, Athawale RB, Kesharwani P. Fighting strategies against the novel coronavirus pandemic: Impact on global economy. Front Public Health 2020;8:606129.
5. Osterhaus A, Mackenzie J. Pandemic preparedness planning in peacetime: What is missing? One Health Outlook 2020;2:19.
6. Lal A, Abdalla SM, Chattu VK, Erondu NA, Lee TL, Singh S, *et al.* Pandemic preparedness and response: Exploring the role of universal health coverage within the global health security architecture. Lancet Glob Health 2022;10:e1675-83.
7. Pillai P. How do data bolster pandemic preparedness and response? How do we improve data and systems to be better prepared? Patterns (N Y) 2021;2:100190.
8. Lal A, Ashworth HC, Dada S, Hoemeke L, Tambo E. Optimizing pandemic preparedness and response through health information systems: Lessons learned from Ebola to COVID-19. Disaster Med Public Health Prep 2022;16:333-40.
9. Reddy KS, Negandhi H. Public health is key to pandemic preparedness. Natl Med J India 2020;33:321-3.
10. Naguib MM, Ellström P, Järhult JD, Lundkvist Å, Olsen B. Towards pandemic preparedness beyond COVID-19. Lancet Microbe 2020;1:e185-6.
11. Boyce MR, Asprilla MC, van Loenen B, McClelland A, Rojhani A. How do local-level authorities engage in epidemic and pandemic preparedness activities and coordinate with higher levels of government? Survey results from 33 cities. PLOS Glob Public Health 2022;2:e0000650.
12. Adashi EY, Cohen IG. The pandemic preparedness program: Reimagining public health. JAMA 2022;327:219-20.
13. Fauci AS, Folkers GK. Pandemic preparedness and response: Lessons from COVID-19. J Infect Dis 2023;228:422-5.
14. Balkhair A, Al-Jufaili M, Al-Wahaibi K, Al-Riyami D, Al-Azri F, Al-Harthi S, *et al.* "Virtual interdisciplinary COVID-19 team": A hospital pandemic preparedness approach. Oman Med J 2020;35:e190.
15. Khan W, El-Rifay A, Malik M, Kayali G. Influenza pandemic preparedness in the World Health Organization Eastern Mediterranean region. East Mediterr Health J 2019;25:583-90.
16. Collins C, Isbell MT, Ratevosian J, Beyrer C, Abdool Karim Q, Maleche A, *et al.* Build on HIV investments for future pandemic preparedness. BMJ Glob Health 2021;6:e007980.
17. Richard A, Stepanyan D, Ewbank J. Pandemic preparedness – Europe launches research consortium. Nature 2022;603:228.
18. Omar UF, Kharlukhi J, Kaliya-Perumal AK. Time to include pandemic preparedness training to healthcare curriculum. Med Educ Online 2020;25:1820229.
19. Duong DB, King AJ, Grépin KA, Hsu LY, Lim JF, Phillips C, *et al.* Strengthening national capacities for pandemic preparedness: A cross-country analysis of COVID-19 cases and deaths. Health Policy Plan 2022;37:55-64.
20. Possas C, de Souza Antunes AM, de Oliveira AM, de Souza Mendes Santos CD, Ramos MP, de Oliveira Rodrigues Schumacher S, *et al.* Vaccine innovation for pandemic preparedness: Patent landscape, global sustainability, and circular bioeconomy in post-COVID-19 era. Circ Econ Sustain 2021;1:1439-61.
21. de Zeeuw J, van de Kamp J, Browne JL. Medical schools should ensure and improve global health education. Lancet 2019;394:731.
22. Battat R, Seidman G, Chadi N, Chanda MY, Nehme J, Hulme J, *et al.* Global health competencies and approaches in medical education: A literature review. BMC Med Educ 2010;10:94.
23. Kreitlow A, Steffens S, Jablonka A, Kuhlmann E. Support for global health and pandemic preparedness in medical education in Germany: Students as change agents. Int J Health Plann Manage 2021;36:112-23.
24. Aslan D, Sayek İ. We need to rethink on medical education for pandemic preparedness: Lessons learnt from COVID-19. Balkan Med J 2020;37:178-9.
25. Frenk J, Chen L, Bhutta ZA, Cohen J, Crisp N, Evans T, *et al.* Health professionals for a new century: Transforming education to strengthen health systems in an interdependent world. Lancet 2010;376:1923-58.
26. Gloster AT, Lamnisos D, Lubenko J, Presti G, Squatrito V, Constantinou M, *et al.* Impact of COVID-19 pandemic on mental health: An international study. PLoS One 2020;15:e0244809.
27. Dey S, Cheng Q, Tan J. All for one and one for all: Why a pandemic preparedness league of nations? Health Policy Technol 2020;9:179-84.
28. Hamadi HY, Zhao M, Haley DR, Dunn A, Paryani S, Spaulding A. Medicare and telehealth: The impact of COVID-19 pandemic. J Eval Clin Pract 2022;28:43-8.
29. Peluso MJ, van Schalkwyk S, Kellett A, Brewer TF, Clarfield AM, Davies D, *et al.* Reframing undergraduate medical education in global health: Rationale and key principles from the Bellagio Global Health Education Initiative. Med Teach 2017;39:639-45.
30. Knipper M, Baumann A, Hofstetter C, Korte R, Krawinkel M. Internationalizing medical education: The special track curriculum 'global health' at Justus Liebig University Giessen. GMS Z Med Ausbild 2015;32:Doc52.
31. Schuster A, Anton N, Grosse P, Heintze C. Is time running out? The urgent need for appropriate global health curricula in Germany. BMJ Glob Health 2020;5:e003362.