Review Article

COVID-19 in India: Making a Case for the One Health Surveillance System

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Summary

Pandemics like COVID-19 warrant an urgent implementation of the one health surveillance (OHS) system to the focus on multisectoral, multidisciplinary, multi-institutional, and multispecialty coordination, in all aspects of the response to outbreaks that might involve humans, animals, and their environment. The Indian system so far has evolved in conducting surveillance and monitoring of parameters within the domain of human health, animal health, and the environment, but in silos. This commentary piece provides an opinion to boost the existing surveillance activities for early detection and ways to develop an integrated OHS to prevent future COVID-19 like pandemics in India. It also attempts to provide possible solutions at the interface of human–animal–environment, from the simpler to the complex system integration with the principles of one health.

Key words: Coronavirus disease 2019, India, one health surveillance, one health

Intoduction

The COVID-19 pandemic provides an opportunity to investigate (re) emerging diseases at the interface of the human–animal–environment, i.e., one health (OH).[1] In India, it is essential to develop a stringent surveillance system for early identification to break the chain of transmission.[2] This commentary piece attempts to provide opinions on how the COVID-19 pandemic provides foster to initiate the OH surveillance (OHS) system by deliberating ways during and post-COVID-19.

Surveillance Systems in India

At present, in India, COVID-19 surveillance is operationalized through the existing integrated disease surveillance program (IDSP) network.[3] All suspected (through contact tracing) and confirmed cases (through laboratory tests) are being reported through active surveillance. As per our knowledge, there is no special effort aimed at animal disease surveillance or environmental monitoring. However, the Indian Council of Medical Research has tested the bat population and documented the coronavirus in two bat species during the outbreak.[4] A summary of the routine surveillance strategies across the OH domains and their responsible authorities is presented in Table 1.

The three broad domains of OHS are surveillance in humans, animals, and the environment. On the human front, IDSP captures the symptomatic, presumptive, and confirmatory diagnosed cases. This misses most asymptomatic cases, those not seeking care or seeking care from private providers, as these are only voluntarily reporting to the IDSP. The information on the incidence of livestock and poultry diseases, following the guidelines of the World Organization for Animal Health (OIE), is collected and reported through the National Animal Disease Reporting System under the Ministry of Fisheries, Animal Husbandry and Dairying. However, the risk-based

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Table 1: Routine surveillance strategies across the domains of one health in India

Domain	Name of surveillance	Salient features	Responsible authority
Human health	IDSP[3]	Form-S (symptoms, based on syndromic approach), Form-P (presumptive cases, based on provisional diagnosis) and Form-L (laboratory cases, based on laboratory-confirmed cases)[5]	NHM, NCDC, MoHFW
Animal health	NADRS[6,7]	FIR, DI cases	MoFAHD
	ADMAS[8]	Early warning of disease incidence or outbreaks and the alert system. Manages disease outbreaks and risk factor databases	NIVEDI, ICAR
Environment	Water monitoring[9]	Physicochemical and bacteriological parameters of surface waters, water lands, and groundwater	CPCB, MoEFCC, and CWC, MoWR
	Water monitoring[10]	Quality monitoring of the drinking water	DoDWS, MoWR
	Soil tests[11]	Physical, chemical, and biological properties of the soil soil health card (nutrient recommendations to farmers)[12]	ICAR, MoA
	Meteorological observations[13]	Weather forecasting and seismology	IMD, Ministry of Earth Sciences
Food	Food quality[14]	Food quality tests through the INFoLNeT	FSSAI, MoHFW, and MoA

IDSP: Integrated Disease Surveillance Program, NHM: National Health Mission, NCDC: National Center for Disease Control, MoHFW: Ministry of Health and Family Welfare, NADRS: National Animal Disease Reporting System, ADMAS: Animal Disease Monitoring and Surveillance, NIVEDI: National Institute of Veterinary Epidemiology and Disease Informatics, ICAR: Indian Council of Agricultural Research, FIR: First information report, DI: Daily incidence, MoFAHD: Ministry of Fisheries, Animal Husbandry and Dairying, MoA: Ministry of Agriculture, IMD: India Meteorological Department, FSSAI: Food Safety and Standards Authority of India, CPCB: Central Pollution Control Board, MoEFCC: Ministry of Environment, Forest and Climate Change, CWC: Central Water Commission, MoER: Ministry of Water Resources, DoDWS: Department of Drinking Water and Sanitation, MoWR: Ministry of water resources, INFoLNeT: Indian Food Laboratories Network

prediction of the animal diseases is under the purview of a different ministry, i.e., Indian Council of Agricultural Research-Ministry of Agriculture. The animal surveillance still faces challenges of clear case definitions, fragmented and paper-based information systems, and conflicting governance and regulatory authorities.[15] A similar pattern is also observed in the case of water monitoring; there are three different bodies under two ministries responsible for monitoring, i.e. Central Pollution Control Board-Ministry of Environment, Forest and Climate Change; Central Water Commission-Ministry of Water Resources (MoWR); and Department of Drinking Water and Sanitation-MoWR.

To mitigate the current COVID-19 or other future pandemics, it is important to have a comprehensive overview of the collected data across the three OH domains. OHS is a system of collaborative efforts across all actors of the human–animal–environment interface throughout all stages of the surveillance process, to produce and disseminate information toward optimal health for all. We propose here a stepwise approach to OHS establishment in India, considering the current strength and challenges of the surveillance systems and utilizing COVID-19 as a catalyst for implementation.

Ways to Boost the One Health Surveillance System During Coronavirus Disease 2019

Sewage water surveillance presents an opportunity to assess infection burden and to identify communities requiring more intense human testing, risk communication, and containment. Studies in Australia,[16] France,[17] Germany,[18] the Netherlands,[19,20] and the United States[21] identified the virus in sewage water and indicate the feasibility of sewage water surveillance. Such a system allows for noninvasive, population-based monitoring of caseloads, including asymptomatic cases. Due to the structure of sewage networks, with main lines, accesses points, and subdivided grids, it is possible, through the strategic selection of samplings points, to divide the population according to district, ward, or even community. This system can form a cost-effective mechanism for the early identification of the presence of the virus in the community. Thus, the scope of the current water surveillance in India should be extended to include the identification of COVID-19 in sewage water. This surveillance data could be utilized for an integrated analysis in the context of OH, i.e., data of sewage water, and the IDSP data could be mapped together to identify hotspots and high-risk population, which would allow for more targeted efforts and more specific interventions. Spatial analyses using geographic information system are extremely useful for monitoring and predicting disease distribution and spread, through the integration of disease occurrence data with weather parameters, local topography, or other geographic features (e.g., rivers, roads, and marshes). A similar strategy has also been adapted during the polio eradication program.[22]

A continuous surveillance among the bat population is important to monitor the high-risk animals. With anecdotal evidence on virus transmissions, monitoring of the susceptible species such as cats, dogs, and tiger[23] is necessary. This will assist to understand the reverse zoonoses and the mutated virus spillover. Similar integrated analysis could be conducted for the animal and human cases to identify further hotspots. These integrated analyses during the COVID-19 could be the first step toward the development of the OHS system in the country.

Ways to Boost the One Health Surveillance System Post-Coronavirus Disease 2019

While COVID-19 is currently driving accelerated implementation of OH measures, including OHS, it is important to maintain the momentum of progress post-COVID-19. As a first step, integrated analysis, as illustrated above, needs to be extended to other (re) emerging diseases. The focus should be on risk prediction and hotspot identification at the early stage. Thus, the respective surveillance system should extend their scope of ongoing surveillance across the OH domains. High-risk populations (such as animal handlers, veterinary professionals, livestock farmers, slaughterhouse workers, animal food vendors, and pet owners)[24,25] and healthcare workers[26] need to be considered under the IDSP. To minimize the risk of zoonotic disease outbreaks after initial disease spillover, it is essential to monitor the food and livestock animals, i.e., chickens, goats, cattle, and fish. The current system should also implement a routine health check-up during import and export of animals across state boundaries. The scope of water surveillance needs to be extended to other high-risk water bodies, i.e. irrigation and hospital water. The food safety surveillance should be extended to a systematic risk-based inspection of animal food production centers and live animal markets.

The second step toward OHS, the surveillance data of the individual sectors needs to adhere to a set data standard to allow data sharing through an integrated database. Digital initiatives in India, such as the Open Government Data Platform,[27] could be a portal to facilitate the integration of sectoral databases. Such a database enables integrated analysis for the identification of disease patterns, hotspots, and real-time risk prediction.

For the third step toward OHS, comprehensive investigations of risks by multidisciplinary teams across the sectors need to be developed. Such multidisciplinary collaborations are required both at policy and the grass-root level to enable more rapid risk detection and consequent prevention and containment actions. The integrated OHS data could be collected through a multidisciplinary team at a single point of time as evinced in avian influenza outbreak management. The newly formulated state- and district-level zoonoses committees could be a potential multidisciplinary OHS data collection team at the grass-root level.

The operationalization of OHS system requires commitment from all sectors. The strong political will, budgetary allocation, convergence between various ministries, robust laboratory networks, and skilled human resources should be considered during the operationalization. The proposed national pioneer body, i.e., National Institute of OH,[28] indicates the political commitment towards OH implementation by the government. As the OH action, compared to the unisectoral scenario, indicates immense cost-saving potential in the global north,[29] a sharing budget toward developing the OHS system could be a potential way forward.

In conclusion, COVID-19 pandemic control provides an excellent opportunity to pledge and foster OHS system in India, including the development of sewage water surveillance for COVID-19. This could be a cost-effective method to predict the COVID-19 disease load and would help locate the disease hotspots, including asymptomatic cases. Beyond the current outbreak, the proposed integrated database for risk prediction and the multidisciplinary approach for risk identification are essential for early detection and containment of future (re) emerging diseases.

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Conflicts of interest

There are no conflicts of interest.

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