IHR (2005) Implementation and Health Security Capacities at National and Sub-national Levels in India in the Context of COVID-19 Outbreak

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Abstract

Background: The implementation of International Health regulations (2005) ensure public health measures to prevent, detect, and respond to threats and events, including infections disease events like COVID19 to the prevention and control of the international spread of the disease. At the onset of COVID-19 outbreak, we analysed India's national and subnational level preparedness capacities against COVID19.

Methods: India's health security capacities were reviewed using five indices, i) prevent, ii) detect, iii) respond, iv) enabling function and v) operational readiness using the 2019 score of India's State Party Annual Report. For subnational analysis, a composite measure is developed for operational readiness capacity for each state using Sustainable Development Goal index score for good health and well-being (SDG3) and indicators of COVID19 preparedness and readiness capacity.

Results: India had score 60% for prevent, 90% for detect, 63.3% for respond, 80% for enabling function and 74.4% operational readiness and they were at level 3, 5, 4, 5 and 4 respectively. Out of 36 federal states, 5 (14%) states were level 5, 10 (28%) at level 4, 17 (47%) at level 3 and 4 (11%) states at level 2 for the operational readiness index.

Conclusions: India's capacity to prevent, detect, and respond to outbreaks were comparable with other countries in the SEAR region. It performed better on prevent, detect, respond and enabling function, which suggest that effective response to COVID19 pandemic could be enabled. The operational readiness capacities of federal states are comparable except for the few states. However, it needs to corroborate with local risk assessment due to COVID19 to fully understand the readiness capacity. Rapid development of capacities at the sub-national levels are needed to strengthen national readiness capacities.

Background

In December 2019, China reported to WHO cases of pneumonia of unknown cause occurring in Wuhan, Hubei.¹ The country's capacity to detect cases facilitated early recognition and verification of the pathogen. Viral genetic sequencing of samples indicated a novel coronavirus.² Early indications suggest that bats are the primary reservoir for the virus, given COVID-19's close similarity to bat coronaviruses,³ and while identification of the zoonotic origin of the virus continues.

On Jan 30, WHO declared the outbreak of COVID-19 as a public health emergency of international concern under the IHR(2005). The public health measures for managing the outbreak like COVID19 rely on existing national and regional preparedness capacities to prevent, detect, verify, assess, and respond in accordance with the International Health Regulations (IHR, 2005). Since the IHR came into force in 2007, countries have made substantial efforts to strengthen their capacities to prevent, detect, and respond to public health emergencies.⁴ Countries have been enhancing preparedness through the implementation

and regular assessment of IHR national capacities using the components of the WHO IHR monitoring and evaluation framework to mitigate the effect of public health emergencies, including the emergence of a novel pathogen.⁵

Since 31 December 2019 and as of 25 May 2020, over five million cases of COVID-19 were reported, including 344,731 deaths from 212 countries and territories.^{6,7}

India reported the first case on 28 February 2020, from Kerala in a student who returned from Wuhan, China.⁸ As of 25 May 2020, India reported 144,941 cases and 4,171 fatalities. Majority cases were reported from five states; Maharashtra, Gujarat, Delhi and Tamil Nadu, Madhya Pradesh.⁹ India responded to the COVID-19 outbreak by putting measures like early detection of suspected cases and their quarantine and isolation and entry screening for passengers from China and other affected countries at major international ports on January 21 before WHO declared COVID-19 a public health emergency of international concern (PHEIC).¹⁰

Resilient health system and Universal health coverage (UHC) aligned with the sustainable development goals (SDGs) are essential to build emergency preparedness capacity viz. ability to quickly identify and isolate a threat, target resources to it, minimising disruption to provision of essential health services during crisis.¹¹

We aimed to analyse the 2019 SPAR scores to review the health security capacities at the national level. We also conducted analysis of the State level data on sustainable development (SDG) health goal and COVID-19 related preparedness and readiness for sub national level, which can provide information to identify gaps and strengths to strengthen IHR implementation vis a vis to respond to COVID-19.

Methods

The methodology of index development and analysis is based on an earlier publication by Kandel N et al¹² in Lancet. We analysed India's 2019 SPAR score to review health security capacities on the basis of the following indices: (1) prevent, (2) detect, (3) respond, (4) enabling function (resources and coordination capacity), and (5) operational readiness. The scores for 18 of the 24 SPAR indicators were applied across the five indices. Six SPAR indicators that were not directly related to these indices and infectious hazard threats, including COVID-19, were excluded.¹³

The SPAR indicators selected for use and the rationale for including the indicators as part of the respective indices are shown in Panel 1.

Panel 1
Selected indicators and rationale for the use

Indicators	Rationale for using indicators in each index
Capacity to prevent	
C3.1. Collaborative effort on activities to address zoonoses	Evidence suggesting a link to zoonoses.
C4.1 Multisectoral collaboration mechanism for food safety events	Infectious disease outbreaks can be brought about by gaps in food safety.
C9.2 Capacity for infection prevention and control (IPC) and chemical and radiation decontamination	IPC at the community and healthcare facility level is key for prevention, control and containment of the infection.
C10.1 Capacity for emergency risk communications	Reaching out to every communities at the local, national and global levels are essential for prevention, detection and control of the infection.
C11.1 Core capacity requirements at all times for designated airports, ports and ground crossings	Core capacities to prevent, detect and respond at the points of entry are crucial for prevention and control of infectious disease outbreaks.
Capacity to detect	
C5.1 Specimen referral and transport system	Not all countries will have capacity to test specimens. Therefore, countries should have a system of specimen referral, transportation and testing of suspected cases.
C5.3 Access to laboratory testing capacity for priority diseases	
C6.1 Early warning function: indicator-and event-based surveillance	Reporting from communities, health care facilities and Points of entry are crucial for prevention and detection of infectious disease outbreaks.
C6.2 Mechanism for event management(verification, risk assessment, analysis investigation)	Capacity for verification, risk assessment, analysis Investigation is crucial for the prevention, detection and control of infectious disease outbreaks
Capacity to respond	
C8.1 Planning for emergency preparedness and response mechanism	Response capacity depends on availability of preparedness and response plans and mechanisms and regular testing for functionality and updating them to address gaps
C8.2 Management of health emergency response operations	Any public health events require incident management systems to be followed. Therefore, the capacity to respond effectively to

	an outbreak depends on strong capacity of emergency operations.
C8.3 Emergency resource mobilization	During response, it is necessary to mobilise all types of resources in a timely manner(funds, human resources and logistics)
C9.1 Case management capacity for IHR relevant hazards	Effective response to outbreaks and other health emergencies depends on case management.
C9.2 Capacity for infection prevention and control and chemical and radiation decontamination	Capacity on IPC is needed for effective case management and infection control
C11.2 Effective public health response at points of entry	Any suspected case detected at points of entry needs to be managed effectively, otherwise the risk of transmission across borders remain high
Enabling function index	
C1.3 Financing mechanism and funds for timely response to public health emergencies	Availability and accessibility of financing mechanisms is essential for prevention, detection and control of infectious disease outbreaks
C2.2 Multisectoral IHR coordination mechanisms	Multi-sectoral coordination and action is needed to manage Public health events including infectious disease outbreaks
C7.1 Human resources for the implementation of IHR capacities	During emergencies, different skill sets, surge capacity and timely mobilisation of health care workers is needed to prevent, detect, and control events
C8.3 Emergency resource mobilization	During response, it is necessary to mobilise all types of resources to manage events
C9.3: Access to essential health services	Access to the essential health services are needed to prevent, detect and control infectious disease outbreaks. It is necessary to ensure continuity of essential health services during emergencies
Operational Readiness Index (C1.3, C2.2, C3.1, C4.1, C5.1, C5.3, C6.1, C6.2, C7.1, C8.1, C8.2, C8.3, C9.1, C9.2, C9.3, C10.1, C11.1 and C11.2)	The following 18 indicators of the SPAR(12) have been used to develop an index for operational readiness**. The index helps to assess the status of national readiness capacities across each WHO region.

*According to WHO, operational readiness to respond to emergencies is a high level of readiness will allow a timely, effective and efficient response. Achieving readiness is a continuous process of establishing, strengthening and maintaining a multi-sectoral response infrastructure that can be applied at all levels, which follows an all-hazard approach, and which focuses on the highest priority risks.

Operational readiness builds on existing capacities to design and set up specialized arrangements and services for emergency response.¹⁴

Index development and analysis:

The five levels used to rate the indices are similar to the capacity levels used to assess countries using SPAR (Panel2).^{15,16}

Panel 2
Criteria and definitions for levels

Levels	Definitions
Level1: <=20%	There is very limited functional capacity in place to prevent and control the risk/event
Level2: <=40%	There is limited functional capacity available on an <i>ad-hoc</i> basis with the support of external resources
Level3: <=60%	The functional capacity is able to perform well at the national level; however, there is limited effectiveness at the sub-national levels. This study considers this level as developmental.
Level4: <=80%	The capacity has demonstrated its functionality well at the national and sub-national levels against various events
Level5:> 80%	The functional capacity is well advanced and sustainable at all levels of health systems

Operational readiness capacity measure for sub-national level

We developed a composite measure (index) for operational readiness capacity for each state of India using the key variables (Panel 3) and steps:

Panel 3
Variables used to assess sub national operational capacity

Sustainable Development Goal index score for Good health and well-being (SDG3)¹⁷	COVID19 specific capacities¹⁸
Maternal mortality ratio	Total sample tested (laboratory capacity)
Proportion of institutional deliveries	Total isolation beds
Under 5 mortality rate per 1000 live births	Total ICU beds
Percentage of fully immunised children in the age group 0-5 years	Number of ventilators
Total case notification rate of tuberculosis per 1000000 population	Oxygen manifold available
HIV incidence per 1000 uninfected population	Available PPEs
Percentage of currently married women aged 15-49 years who use any modern method of family planning	Available N95
Total physicians, nurses and midwives per 10,000 population	Management of biomedical waste
	Total quarantine facilities

Step 1:

We conducted a transformation (log and normal) of the data into a non-dimensional scale and removing outliers (rates and absolute numbers) and normalised them. The log transformation was done to give more weight to the difference between the states with lower values and less weight to the states with higher values for indicators.

Setting up minimum and maximum and rescaling–

this will help to bring all data set into one dimension and exclude the distortion effect of outliers on indicator's set. A scale of 0 to 1 is used (higher the scale lower the capacity)

$$X_n = \frac{(\log(X) - \log(\text{Min}))}{(\log(\text{Max}) - \log(\text{Min}))}$$

X – Value for the given country X for the indicator's dataset

X_n – Normalized value of Country X for the indicator's dataset

Min – Minimum value for the indicator's dataset

Max – Maximum value for the indicator's dataset

Step 2:

We aggregated data either using geometric or arithmetic average. These aggregation methodologies are applied to indexes at each level to progress through the levels in a hierarchical bottom up approach.

$$\text{Arithmetic Average of A, B, and C} = \frac{(A + B + C)}{3}$$

Total capacity for COVID19 = Isolation beds^{1/n} × ventilators^{1/n} × Quarantine beds^{1/n} ×

OPR capacity (total and SDG) = Total capacity^{1/2} × SDG index^{1/2}

Step 3:

The aggregate score is converted to level 1 to level 5, where the level 5 is better and level 1 is worst. Higher the score higher the level (Panel 4)

Panel 4
Criteria and definitions for levels

Levels	Definitions
Level 1: ≤20% (0.2)	There is no functional capacity in place
Level 2: ≤40% (0.4)	There is limited functional capacity available on the <i>ad-hoc</i> basis with the support of national/external resources
Level 3: ≤60% (0.6)	The functional capacity is under development status and functioning well at the state levels; however, there are limited at the sub-state levels
Level 4: ≤80% (0.8)	The capacity has demonstrated its functionality well at the state and sub-state levels against various events
Level 5: >80% (0.8)	The functional capacity is well advance and sustainable at all levels of state health systems

Patient and public involvement:

The study is based on secondary data analysis of IHR self assessment scores available in public domain and does not have any patient public involvement.

Results

India's overall score for IHR implementation as per SPAR 2019 assessment is 78 percent. The top challenges found were: Health Service Provision 33%, Zoonotic Events and the Human–animal Interface 60%, Food Safety 60%, Laboratory 67%.

India's capacity to detect (90%) was found to be at level 5 whereas respond (63.3%), enabling function (80%) and operational readiness (74.4%) capacities were found to be at level 4. Prevent capacity score was 60 percent at level 3. At sub-national level, 17 states (47%) states had operational readiness at level 3. Around one sixth states (5/36) had operational readiness at level 5. States with highest level of

readiness (14%) capacity (Level 5) accounted for the maximum case load with 79918 cases, 29388 discharges and a case fatality rate of 3.21 percent.

Prevent capacity:

India's prevent capacity is rated as moderate at level 3(60%), whereas the regional average for SEA region is at level 3 (58%) and the global average for prevent capacity which is at level 4 (61%). The score for capacity requirements at all times for designated airports, ports and ground crossings and emergency risk communication was 80% (level 4) whereas capacity for infection prevention and control was limited at level1.

Detect capacity:

The overall score for capacity to detect encompassing system for generation of early warning signal and verification (100%), specimen referral and transport (80%), access to laboratory testing was robust at level 4 (80%). India fared better in capacity to detect as compared to SEAR countries (78.5%), as well as globally (75.5%).

Respond:

The score for capacity to respond was 63 percent; little above moderate.

The overall score for capacity to respond was higher as compared to SEAR(56.1%) and global levels (58.8%). India's score for emergency preparedness and response, management of health emergency response operation, effective public health response at PoEs and emergency resource mobilization was 80% (level 4) whereas the score for case management for IHR relevant events was 40% (level 2).

Enabling function:

India had high score (80% at level 4) for the enabling function; higher than the score of SEAR (65%) countries as well as overall global score (65.6 %). The score for capacities pertaining to financing mechanism and funds for timely response, multi sectoral IHR coordination mechanisms, human resources capacity for IHR implementation was at level 4, however, score for capacity on access to essential health services was 40%(level 2).

Operational readiness capacity:

Based on the composite score for operational readiness, India showed good operational readiness (74.4%, level 4) to prevent, detect and control an event, however, IPC at level 1(20%) and essential health

services at level 2(40%)were found to be limiting factors.

Operational readiness capacity for sub-national level:

The operational readiness of the states was assessed using a composite measure.

17 (47 %) out of 36 states had operational readiness capacity at level 3 implying that the capacity is under development. Five (13.8%) states have robust operational readiness capacity at level 5 and include Maharashtra, Tamilnadu, Gujarat, Andhra Pradesh and Kerala. Four (11%) states had limited capacity and include Mizoram, Lakshadweep, Nagaland and which one is the fourth one. Ten (27.7%) states have good functional capacity at Level 4.

Figure 2 shows map of India depicting the number of cases per 100000 population and case fatality rate. Higher case load is seen in states of Maharashtra (47190), Tamilnadu (15512), Gujarat(13664), Delhi (12910) followed by Rajasthan(6742).The highest case fatality is seen in West Bengal(7.8%), followed by Meghalaya (7.1%), Gujarat(6.1%), Madhya Pradesh(4.4%) and Maharashtra (3.3%) as on 25 May, 2020.

States with highest level of readiness capacity (Level 5) accounted for the maximum case load with 79918 cases, 29388 discharges and a case fatality rate of 3.21 percent as shown in Fig 3. States with level 4 operational readinesses reported 20150 cases, 10647 discharges with a case fatality rate of 2.98 percent. States at level 3 have reported total of 29141 cases, 14288 discharges with a case fatality rate of 2.37. States with limited capacity at level 2 reported no cases as shown in figure 4.

Discussion

We used the 2019 SPAR to assess the country's capacity to prevent, detect and respond to public health events including COVID19. The response to SPAR for various capacities is collated at national level in consultation with stakeholders and the report is submitted to WHO through the NFP-IHR mechanism. The study has limitations as it does not take into account the IHR capacity data at sub national level as there is no mechanism to collection and report the sub-national information based on the IHR reporting. India is a federal state with variations in level of capacity at each level. Therefore, to reflect the sub-national capacity we used the SDG and COVID19 related data, which may not be sensitive and specific as that of SPAR score. However, they reflect the health systems capacity and resilience.

The study takes into account the strength of IHR capacities at national level and does not take into account several factors that affect the emergence and spread of an infectious disease outbreak within countries and between regions, including IHR adherence to infection prevention and control measures, population movement, climate-related pressures, and the density of populations. When an outbreak is caused by an airborne pathogen, population movement and density or crowding are known to directly affect spread of infection. Analysis of other risk variables associated with tackling an infectious disease outbreak and managing health emergencies would benefit understanding of existing capacities, including

vulnerabilities due to socioeconomic conditions, co-morbid conditions, and lack of health infrastructure, which we did not take into account.

Prevent capacity:

India scored at Level 3 in the prevention capacity which is in line with the average prevention capacity in SEA region and globally. Majority of the countries (70%, 130/182) have moderate prevention capacity as reported by study on health security capacities in context of COVID-19. In SEA region, Thailand has robust prevention capacity.²¹

The Points of Entries (PoEs) used their past experience of implementing prevention and control measures during the recent PHEICs i.e. Ebola, Zika and H1N1 in coordination with Immigration, Civil aviation, etc. and screening for COVID-19 was initiated at all major international airports.²⁵

Detect capacity:

India's detection capacity is robust and is reflected on the detecting and verifying COVID19 cases. This result is similar to the results of most of the countries globally reporting robust detection capacity.¹² This is due to strengthened surveillance and laboratory network India's surveillance system, the Integrated Disease Surveillance Programme (IDSP) through its national, state and district surveillance units supported community surveillance since the onset of the pandemic.²⁶

A team of virologists, epidemiologists and lab technicians are involved in detection and management efforts to contain Covid-19 with testing capacity scaled up to 95,000 tests per day through 332 government and 122 private laboratories under the Indian Council of Medical Research (ICMR) laboratory network.²⁷ This has been possible due to the investment in human capital and infrastructure for the detection capacity.

Respond capacity:

Our findings show that India's respond capacity is moderate as compared to robust respond capacity displayed by Thailand in the South East Asia region; however, it is comparable to average capacity of SEAR countries. According to a study published by Kandel et al, more than fifty percent countries reported either low or moderate capacity.¹² These findings suggest that there is a need to enhance the respond capacity of the countries globally including India which can be achieved through strengthening emergency preparedness, emergency resource mobilization and effective prevention and control strategies for infectious disease outbreaks.

Communicating the risk effectively to the public has been the core strategy of preventive and control measures to combat COVID-19. Risk communication strategies adopted include setting up a 24x7

National Helpline, community engagement through Gram Sabhas, regular media briefings, and public awareness campaigns on safe practices such as hand hygiene, respiratory etiquette and physical distancing has been scaled up through various channels of communication.²⁸

Aarogya Setu, a mobile application launched by Gol proactively informs the users of the app regarding risks, best practices and relevant advisories pertaining to the containment of COVID-19.”²⁹ Similarly, Republic of Korea’s has also used smart phone apps to flag infection hotspot and send alerts on cases and access to testing.³⁰

Infection prevention and control (IPC) measures are essential to ensure healthcare workers are protected from infection with 2019-nCoV and amplification events in healthcare facilities. This finding is similar to other countries.^{31,32} An IPC programme at national and facility level with a dedicated and trained team, or at least an IPC focal point, should be in place and supported by the national authorities and facility senior management.³³ Other major challenges for India include limited functional capacity for case management capacity for IHR related hazards. The case management is vital capacity to control the COVID19 pandemic.

Enabling function:

India has better enabling function in place as compared to the global and regional average, which is evident from the multi sectoral approach adopted by the government and availability of financing mechanisms, adequate human resources and emergency logistics for timely response to public health emergencies. However, enabling function was found to be low in many low resource countries underlining the importance of increase investments for scaling health security and IHR implementation.¹² Major challenge faced during the time of COVID-19 was due to limited investment in adequately trained human capital like epidemiologists, public health, allied health sciences, statistics, disease modelling, and communication specialists at the state, the district level and below.³⁴

Operational readiness capacity:

At national level, India’s operational readiness capacity shows robustness which is evident from the pre-emptive public health response shown by the country, which is similar to the results of the Government Response Stringency Index – developed by the Blavatnik School of Governance, University of Oxford – India scored a full 100.³⁵

Despite of having better enabling function and operational readiness capacity, India has low capacity on provision of essential health services. The Empowered Group on human resources has worked out various cadres of personnel across departments for ensuring maintenance of other essential medical services. The government made an effort to provide essential services by mapping health facilities, mobile app and use of telemedicine.³⁶ However data on a range of hundreds of indicators shows a

worrying disruption in India's basic health services. At least 100,000 children did not receive their BCG vaccination, another 200,000 missed each dose of the pentavalent vaccine, at least 350,000 fewer people received outpatient treatment for diabetes, 150,000 fewer people received outpatient treatment for mental illness and nearly 100,000 fewer people received outpatient cancer treatment in March 2020 as compared to March 2019.³⁷ Similar findings have been seen in a survey conducted by WHO which showed that more than half (53%) of the countries surveyed have partially or completely disrupted services for hypertension treatment; 49% for treatment for diabetes; 42% for cancer treatment, and 31% for cardiovascular emergencies.³⁸

Long-term underinvestment in health services, as seen in many countries, impairs their resilience by depleting their ability to respond to surges in need for health care with sufficient health professionals, intensive care unit beds, protective equipment, diagnostic test kits, and mechanical ventilators.³⁹

Operational readiness capacity for sub-national level:

As there is no standard mechanism to collect and generate health security capacity status of sub-national, we used the existing measures of health systems together with the COVID19 preparedness information by developing the composite measure to determine the capacity of each state. The measures can provide robust and reliable information at a time when there is dearth of information at the sub-national level. It can provide vital information to prioritise and plan for emergency preparedness and response. Majority of the states have operational readiness at level 3. In India, each state has the population size comparative to many European countries.⁴⁰ States with level 5 operational readiness like Tamil Nadu, Maharashtra, Gujarat, contributed to maximum case burden with high mortality rates. Maharashtra, the state with the most number of Covid-19 patients in India, has a population similar to that of Japan, one of the countries doing comparatively well in the global fight against the novel coronavirus. The States with the strong health systems are the one which are bearing the brunt of COVID19 which is similar to the global situation observed in many high income countries like US, Italy, Spain and UK and yet the world needs to establish causal theories for this phenomenon.⁴¹

Kerala is one of the states which is performed well among the States. The state is known for its health systems capacity and many of the health outcome and impact measures are one of the better in the world. With its experience of handling the Nipah outbreak in 2018, Kerala realised the merits of containing virus transmission by quickly tracing all the contacts and repeated it to perfection this time as well. Kerala with its good health-care infrastructure, strong political and administrative leadership, local community engagement has been lauded for the "unparalleled" containment and testing strategies referred to as the "Kerala model". It is a success born out of decades-old social revolution and development. Similar findings have been reported from another study which highlights negative relationship between the two variables (medical infrastructure using per-capita health expenditure at the state level) affirming that the more a state spends on the health sector, the lower will be the severity of any disease.⁴²

The COVID19 pandemic has highlighted the need for countries to understand that the virus can overwhelm even the most robust health systems, resulting in the need to entirely reconfigure health sectors in response. As the world responds to the pandemic, there will be many lessons to strengthen preparedness in future; however, looking at the Kerala model and other countries in the world which are responding the pandemic well they have some commonality in capacities. They are strong leadership and governance, community engagement and mobilisation of community workers, accountability of public and the government, rapid mobilisation of resources and existing health systems experience of handling outbreaks and events. Investment in these areas is equally important while strengthening health systems for health security capacities for emergency preparedness and response.⁴³

Abbreviations

SDG: Sustainable Development Goal

SEAR : South East Asian Region

IHR: International Health Regulation

WHO: World Health Organization

PHEIC: Public Health Emergency of International Concern

UHC: Universal Health Coverage

SPAR: State Party Self-Assessment Annual Reporting

IPC: Infection Prevention Control

ICU : Intensive Care Unit

PPE: Personal Protective Equipment

ICMR: Indian Council of Medical Research

IDSP: Integrated Disease Surveillance Project

Declarations

Ethics approval and consent to participate:

Not applicable

Consent to publish:

Not applicable

Availability of data and materials:

All in public domain

Finding:

None

Competing interests:

None

Source of Maps:

Theses are same maps used by Integrated Disease Surveillance Programme (IDSP) for surveillance of disease in India by Government of India and National Centre for Disease Control (NCDC) Delhi, India.

Author's contribution:

MD conceptualised the study, analysed the data, drafted and finalised the manuscript. NK conducted sub-national data analysis and contributed to conceptualization of manuscript. MD, NK, AS, SS contributed to the concept and developed the concept and finalised the paper. AS, SK, SS, RH, RO and RC saw drafts and provided inputs. All authors approved the final version of the manuscript.

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Figures

Figure 1

Composite indices for india, SEA region and global averages

Operational readiness capacity of India for COVID-19 (n=36 States)

Figure 2

map of India depicting the number of cases per 100000 population and case fatality rate.

Figure 3

States with highest level of readiness capacity (Level 5) accounted for the maximum case load with 79918 cases, 29388 discharges and a case fatality rate of 3.21 percent

Figure 4

States with level 4 operational readinesses reported 20150 cases, 10647 discharges with a case fatality rate of 2.98 percent. States at level 3 have reported total of 29141 cases, 14288 discharges with a case fatality rate of 2.37. States with limited capacity at level 2 reported no cases