

Our Fight Against the Rapidly Evolving COVID-19 Pandemic: A Review of India's Actions and Proposed Way Forward

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Abstract

A new strain of coronavirus named severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) has overwhelmed the world with its rapid spread and high number of cases. SARS-CoV-2 causes COVID-19 disease which may present with mild, moderate, or severe illness. In severe cases, pneumonia, acute respiratory distress syndrome, sepsis, and septic shock can occur. Individuals above 60 years and people with preexisting comorbidities are at higher risk for developing serious complications. The incubation period of this new pathogen ranges from 1 to 14 days and there is no preexisting immunity to the disease. Countries across the globe have adopted various prevention and control measures to minimize negative health impacts. India has adopted various public health measures which include social distancing measures, nationwide lockdown to reduce risk of exposure, widespread IEC messaging regarding hand-washing, usage of masks, and recommending avoidance of unnecessary travel to combat the spread of disease. This manuscript reviews the global situation, contextualizes India's disease control efforts, and outlines the possible way forward by identifying specific actions under the following headings: enhancing district preparedness, enabling care for patients, and broadening community and stakeholder engagement for India.

Keywords: COVID-19, novel coronavirus, pandemic, severe acute respiratory syndrome coronavirus 2

Coronaviruses (CoVs) are enveloped single-stranded RNA viruses that are known to cause infections in both humans and animals. They are classified into four genera: α - β - γ - δ -CoV. Previously, there were six known strains that caused infections in humans. Of these, α -CoV strains (HCoV-229E and HCoV-NL63) and β -CoV strains (HCoV-OC43 and HCoV-HKU1) cause mild respiratory tract infections.^[1] The emergence of β -CoV strains, severe acute respiratory syndrome (SARS)-CoV in 2002 causing SARS and MERS-CoV in 2012 causing Middle East respiratory syndrome, both of which lead to severe and potentially fatal respiratory tract infections, increased the epidemiological significance of the CoVs.^[2] With the discovery of SARS-CoV-2 in 2019, there are now seven strains causing infections in humans.

The SARS-CoV-2 shows genome sequence identity to CoVs isolated from two animal species: 96.2% with CoV RaTG13 in *Rhinolophus affinis* (intermediate horseshoe bat)^[3] and 91.02% with Pangolin CoV in *Manis javanica* (the Malayan pangolin).^[4] The SARS-CoV-2 shares a 79.6% sequence identity with SARS-CoV and uses the same cell

entry receptor as SARS-CoV – the ACE2 protein receptor.^[3] However, the SARS-CoV-2 is spreading at a more rapid rate than its predecessors. There could be several reasons for this; SARS-CoV-2 has a high secondary attack rate which was found to be as high as 83% in a familial cluster.^[5] In addition, presymptomatic transmission of SARS-CoV-2 might also affect the rate of spread. Some studies also report that the timing of the outbreak during the Lunar New Year/Spring Festival might have been one of the factors that enabled more rapid spread.^[1]

Coronavirus disease (COVID-19)

A cluster of pneumonia of unknown etiology was reported in Wuhan City, China, on December 31, 2019. On 7 January, the Chinese authorities identified a new CoV as a cause of pneumonia outbreak. The new strain was named SARS-CoV-2

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How to cite this article: Zodpey S, Negandhi H, Dua A, Vasudevan A, Raja M. Our fight against the rapidly evolving COVID-19 pandemic: A review of India's actions and proposed way forward. Indian J Community Med 2020;45:117-24.

Received: 09-04-20, **Accepted:** 08-05-20, **Published:** 02-06-20.

Access this article online

Quick Response Code:



Website:
www.ijcm.org.in

DOI:
10.4103/ijcm.IJCM_221_20

or the novel coronavirus and the disease as COVID-19. The most common symptoms of COVID-19 are fever, tiredness, and dry cough. Some patients may have aches and pains, nasal congestion, runny nose, sore throat, or diarrhea. These symptoms are usually mild and begin gradually.^[6] Some people become infected but do not develop any symptoms and do not feel unwell.^[6] Most people (about 80%) recover from the disease without needing special treatment. Around 1 out of every 6 people who gets COVID-19 becomes seriously ill and develops difficulty in breathing.^[6]

As per the Revised Guidelines on Clinical Management of COVID-19 by the Ministry of Health and Family Welfare (MoHFW), Government of India, COVID-19 may present with mild, moderate, or severe illness; the latter includes severe pneumonia, acute respiratory distress syndrome, sepsis, and septic shock.^[7] Early recognition of suspected patients and early identification of severe cases allows for timely initiation of infection prevention control and provision for optimal supportive care treatments and rapid admission to intensive care unit, respectively.^[7] The whole population is deemed susceptible to this virus and infection depends mainly on contact with COVID-19-infected patients or other individuals with asymptomatic infections. Individuals older than 60 years of age and people with medical problems such as high blood pressure, heart problems, respiratory disease/asthma, cancer, or diabetes are at higher risk for developing serious complications.^[8]

The incubation period of COVID-19 ranges from 1 to 14 days^[8,9] with majority presenting between 3 to 7 days.^[9] COVID-19 probably emerged from an animal source, but is now spreading from person to person.^[10] The virus spreads mainly between people who are in close contact with one another (within about 6 feet) through respiratory droplets produced when an infected person coughs or sneezes.^[10] It also may be possible that a person can get COVID-19 by touching a surface or object that has the virus on it and then touching their own mouth, nose, or possibly their eyes.^[10] Research exploring the possibility of airborne transmission of SARS-CoV-2 is ongoing. In a study, viral RNA was found to be present in aerosols in isolation rooms of SARS-CoV-2 patients.^[11] Another study found the stability of the SARS-CoV-2 in aerosols, generated under experimental conditions, to be three hours.^[12] According to the National Academies of Sciences, Engineering, and Medicine, USA, available research indicates that viral particles are found in bioaerosols generated through normal breathing of infected people. However, more SARS-CoV-2-specific research is needed regarding the infectivity of such viral particles in bioaerosols. As SARS-CoV-2 is a newly identified pathogen, there is no known preexisting immunity in humans.^[13] We do not know the duration of the protective immune response against SARS-CoV-2.

A few emerging studies have explored the effect of temperature and humidity on the transmission of novel CoV; however, data remain inconclusive. The effect of temperature on survival and transmission of SARS-CoV-2 is yet to be known.^[14]

A report of the World Health Organization (WHO)-China Joint Mission on Coronavirus Disease 2019 (COVID-19) gives a case fatality ratio (CFR) of 3.8% in China.^[13] The CFR was also reported to be higher among males compared to females (4.7% vs. 2.8%). A higher mortality was also reported more in patients with comorbid conditions (CFR of 13.2% for those with cardiovascular disease, 9.2% for diabetes, 8.4% for hypertension, 8.0% for chronic respiratory disease, and 7.6% for cancer) compared to patients without comorbid conditions (CFR of 1.4%).^[13] It also reported an increase in mortality with increasing age, with the highest mortality among people over 80 years of age (CFR 21.9%). Although elderly is affected more, the severity of disease in younger age groups should not be discounted. 20% of deaths from South Korea were reported in people under 60 years of age. 15% of cases requiring intensive care treatment in Italy were among individuals 50 years and younger.^[15] India, with a median age of 26.4 years, has a younger population than most countries. The effect of demographic distribution of the country on the severity of disease is yet to be ascertained.

Global situation

A total of 3,018,952 confirmed cases of COVID-19 were reported globally by World Health Organization (WHO) as on 29 April 2020, affecting a total of 212 countries, areas or territories (16). The European Region and the USA are contributing to the maximum number of cases across the world [Table 1].^[16]

Control measures adopted by countries across the globe

Countries across the globe have adopted various prevention and control measures ranging from social distancing and isolation to shutting down nonessential services and countrywide lockdowns. The testing strategies are also varied with some countries employing selective testing, while others have attempted more widespread testing.

Previous experience from SARS-CoV outbreak shows that isolation of cases and infection control were effective measures to contain the outbreak.^[17] The WHO-China Joint Commission report talks extensively of the efficacy of nonpharmaceutical measures, including isolation/quarantine and community engagement, in controlling the outbreak in China.^[13] Further, modeling studies show that effective social distancing measures are useful in preventing subsequent waves of the infection, irrespective of variations between countries in implementing these measures.^[18]

Table 1: Total cases across the world as reported by WHO on 29 April 2020

	Total confirmed	Total deaths
Globally	3,018,952	207,973
Western Pacific Region	146,720	6,037
European Region	1,406,899	129,311
South-East Asia Region	51,351	2,001
Eastern Mediterranean Region	176,928	7,304
Region of the Americas	1,213,088	62,404
African Region	23,254	903

Proper hand-washing has been shown to inactivate/remove various microorganisms. The use of soap and water or alcohol-based handrub has proven efficacy over various viruses.^[19] The Centers for Disease Control and Prevention (CDC) recommends hand-washing as an effective measure for reducing Covid-19 infections in community settings.

There have been reports of both asymptomatic^[20,21] and presymptomatic^[22] transmission of Covid-19. Further, viral load was found to be similar in symptomatic and asymptomatic cases.^[23] As has already been discussed, there is a plausibility of airborne transmission. Considering these factors, it might be prudent to assume that the use of masks might be beneficial in reducing transmission. The CDC has recommended the use of simple cloth masks or homemade masks in public settings.^[24]

India

India reported its first positive case of novel coronavirus on January 30, 2020, in Kerala, in a student, who returned from Wuhan University [Table 2].^[40] Three positive cases were reported in Kerala till 7 February. All these cases have travel history from Wuhan, China. By 7 March, 33 positive cases (including 16 Italian tourists) were reported in India. By 16 March, there were 114 confirmed cases of COVID-19 in the country. As on 19 April, India had reported 17,264 total COVID-19 cases: 14,175 active cases, 2546 cured/discharged, and 543 deaths.^[41]

India has adopted various public health measures to combat the spread of the disease. There is a policy intervention at the highest level and the Prime Minister has highlighted the government's large-scale efforts. To augment and synchronize the current efforts of the government, the Ministry of Home Affairs constituted 11 Empowered Groups cross-cutting across various administrative departments. Each group consists of four to eleven members who represent different ministries/departments. These groups aid in planning and implementation of COVID-19-related activities.^[42]

Screening and surveillance activities

MoHFW-Government of India issued its first advisory on January 17, 2020, instructing screening of international travelers from China at three airports, namely, Delhi, Mumbai, and Kolkata. Screening at all international sea ports was also conducted. By 3 February, temporary suspension of Indian visa for Chinese passport holders and Chinese nationals was declared and universal screening of all flights coming in from Singapore, Thailand, Hong-Kong, and China was being conducted. Entry screening was extended to flights from Japan, South Korea, Vietnam, Nepal, Indonesia, and Malaysia from 23 February. On 3 March, the Government of India suspended visas of Italy, Iran, South Korea, and Japan and universal screening for all passengers since 4 March came into effect. All passengers were required to duly fill self-declaration form which were to be submitted to health officials and immigration officials and states instructed to enforce quarantine for all incoming passengers as per the

guidelines. No passenger (Indian or Foreign) was allowed to disembark on Indian soil after March 23, 2020. By 30 March, 1,524,266 passengers had been screened at airports.^[41]

Early identification of suspects should be followed by quarantine wherever applicable and they should be subjected to appropriate testing. Those testing positive should be isolated at the designated isolation facilities. Quarantine, testing, and isolation are mainstays in the contained of COVID-19. Additional quarantine facilities have been set up in states. For early identification of cases in community, the surveillance of severe acute respiratory illness is strengthened in states under the Integrated Disease Surveillance Program; all cases are identified and contacts of suspected/confirmed cases are followed up regularly.^[43] In addition, cluster containment strategy for control of local clustering of cases and geographical containment strategy for large outbreaks with single or multiple foci of transmission have been laid out. The strategy in cluster containment includes (a) extensive contact tracing and active search for cases in containment zone, (b) testing all suspect cases and high-risk contacts, (c) isolating all suspect/confirmed cases and providing medical care, (d) quarantining contacts, (e) implementing social distancing measures, and (f) intensive risk communication. The area for geographical quarantine is divided into a containment zone containing the cluster of cases, surrounded by a buffer zone consisting of adjoining blocks of affected district or rural districts of affected city. It implies almost complete interruption of movement to and from the containment area. The strategy includes; (a) detailed outbreak mapping, (b) active surveillance for cases and contacts in the geographic area and enhanced passive surveillance of influenza-like illness and severe acute respiratory illness cases in surrounding districts, (c) expanding laboratory network, (d) three-tier management plan for designated COVID19 hospitals to deal with mild, moderate, to severe and critical cases, respectively, (e) enhancing surge capacity of hospitals, (f) strict perimeter control and thermal screening at entry and exit points, and (g) providing chemoprophylaxis for all asymptomatic healthcare workers and asymptomatic contacts of laboratory-confirmed cases.^[44]

Laboratory network

The National Institute of Virology, Pune, is the designated nodal laboratory and tasked with coordinating the testing of samples for COVID-19 in the country. As on 29 April, a total of 292 government laboratories are operational.^[45] To augment the testing capacity of the country, additionally 97 accredited private laboratories have also been made functional across the country.^[46] As on 30 April, a total of 830,201 samples have been tested in India.^[47]

The current guidelines for COVID-19 testing strategy in India include testing of all symptomatic individuals who have undertaken international travel in the last 14 days, all symptomatic contacts of laboratory confirmed cases, all symptomatic health-care workers, and all patients with severe acute respiratory illness (fever AND cough and/or shortness of breath).^[48] Asymptomatic direct and high-risk contacts of a

Table 2: Description of number of cases, deaths, and public health actions across countries (as on 29 April)

Country	Population (thousands) ^[25]	Median age (years) ^[26]	First case reported	Total number of cases ^[16]	Total tests done	Mortality ^[16]	Public health actions/preventive measures
China	1,392,730	37.4	7 January	84,369	320,000 (as on 24 February) ^[13]	4,643	Wet markets were closed immediately after the outbreak Efforts to identify zoonotic source and virus structure Use of big data and artificial intelligence in contact tracing and medical observation of contacts ^[13] Rapid scaling up of infrastructure and early treatment of cases
Italy	60,431	44.3	23 January	2,01,505	1,910,761 ^[27]	27,359	Establishment of restrictive measures on movement and nonessential services Complete isolation of confirmed cases ^[28]
United Kingdom	66,489	40.2	23 January	161,149	763,387 (as on 28 April) ^[29]	21,678	UK coronavirus Action Plan in four phases: contain, delay, research, mitigate ^[30]
United States of America	327,167	37.4	20 January	983,457	523,142* ^[31]	50,492	Health systems preparedness to reinforce infection control principles Assessing state readiness to implement lockdown, tracking stockpiling of PPE Support in utilizing Public Health Emergency Preparedness funding across states ^[32] Individual state actions: lockdown and social distancing
France	66,984	40.6	24 January	125,464	595,154 (as on 21 April) ^[33]	23,627	Screening at points of entry into the country Closure of nonessential public places and services Requirement of certificate from Government for movement of citizens in public ^[34]
Germany	82,927	45.5	27 January	157,641	2,547,052 ^[35]	6,115	One of the earliest countries to develop reliable test for SARS-Cov-19 ^[36] Widespread testing strategy
South Korea	51,635	39.4	20 January	10,761	619,881 (as on 30 April)	246	Stringent screening at airports Aggressive testing strategy for early detection of cases Effective isolation strategy ^[37]
Singapore	5368	38.1	23 January	15,222	143,919 (as on 27 April)	14	Effective contact tracing ^[38] Regulations for safe distancing measures and stay-at-home notice for those returning from other affected countries under Infectious Diseases Act with penalties for violations of measures ^[39]

*Tested by the Centers for Disease Control and Prevention and USA Public Health Laboratories. PPE: Personal protective equipment, SARS-Cov: Severe acute respiratory syndrome coronavirus, NA: Not available

confirmed case should be tested once between day 5 and day 14 of coming in his/her contact.^[48] Guidelines for hotspots/cluster and in large migration gatherings/evacuees centers require all symptomatic influenza-like illness (fever, cough, sore throat, and runny nose) to be tested (a) within 7 days of illness – rRT-PCR and (b) after 7 days of illness – antibody

test (if negative, confirmed by rRT-PCR).^[48] ICMR has issued guidance on the use of Truenat™ beta CoV as a screening test on April 14, 2020.^[49]

To meet the health-care challenges posed by COVID-19, the government has forged collaborations with the private sector. The Secretary Department of Biotechnology has stated that

the manufacturing capacity of the first indigenous kit is being scaled up to produce nearly ten lakh kits per month starting May. Secretary has also informed of setting up a manufacturing facility for indigenous development of ventilators, testing kits, imaging equipment, ultrasound, and high and radiology equipment in Vishakhapatnam where manufacturing is started in the 1st week of April. Director General, Council of Scientific and Industrial Research, has informed of a five-pronged strategy to find science and technology solutions, comprising (1) surveillance using digital and molecular methods which includes genome sequencing of the virus strains across the country; (2) cheaper, fast, and accurate diagnosis methods; (3) intervention strategies comprising repurposing drugs and developing new drugs; (4) R and D in hospital assistive equipment; and (5) development of supply chain logistics models for items required for Covid-19 mitigation.

The current production capacity of indigenous Personal protection equipment (PPE) kits and N-95 masks as per Press Information Bureau of Ministry of Textiles was more than 1 lakh per day as on 26 April, 2020.^[50] By 23 April a total of 2,033 dedicated COVID facilities with 190,000 isolation beds and 24,000 ICU beds with more than 12,000 ventilators were available.^[51]

Public health measures

On 16 March, social distancing was proposed as a measure of nonpharmaceutical infection prevention and control. These measures were proposed for workplaces, restaurants, public transport, and physical distancing of minimum one meter was advised. Offices, both government and private sector, were advised to discourage entry of visitors, meetings with large number of people, and use digital communication to the maximum extent.

All educational establishments, gyms, museums, cultural and social centers, swimming pools, and theaters were closed and children were advised to stay at home. Local authorities were advised to have meetings with religious leaders to regulate mass gatherings and ensure physical distancing measures. Special advice to high-risk groups (including individuals 65 years and above and children below 10 years of age) to stay at home and avoid large gatherings. On 19 March, all health establishments were advised to avoid nonurgent hospitalization and minimize elective surgeries.

To effectively tackle the rapid spread of the coronavirus, experts across the globe expressed the need to observe stricter social distancing measures. India took a proactive step to enforce this in the early stages of the pandemic. On 22 March, the Prime Minister engaged all individuals and a nationwide voluntary curfew “Janata Curfew” was observed by the people which extended to all public transport services, including railways and metros. On 24 March, a nationwide lockdown came into force and a total ban was imposed on people for stepping out of their homes for a period of 21 days. On 14 April, the lockdown was extended for additional 19 days. All districts in the country have been evaluated on the risk of spread of

disease and demarcated as red, orange, or green zones; as on 17th April, 170 districts are under red zone/hotspot (reporting more than 80% case load of COVID-19 in India or in a state, and/or with doubling rate <4 days) and 353 districts which are placed in green zone (reporting no new confirmed cases in last 28 days). In addition, 207 districts have been identified as potential hotspots/orange zones. Conditional permissions are granted for selective and cautious reopening of selected activities in areas with lower risk of spread of disease.^[52]

Information, education, and communication

The union government, state governments, Panchayati Raj institutions, community-based organizations, non-governmental organizations, civil society representatives, and other voluntary organizations are engaged in spreading the message about COVID-19. Messaging around awareness in the community on signs and symptoms of disease, self-reporting of travel history, and basic public health measures (social distancing measures, proper usage of masks, hand-washing techniques, avoiding unnecessary travel, and maintaining hygiene of common infected surfaces) have been circulated extensively.

A round-the-clock National CDC (NCDC) control room was made operational and a national helpline number and helpline email id is provided to individuals for any queries related to COVID-19. The MoHFW website cohesively collates and displays information, advisories, and guidelines on COVID-19. A psychosocial helpline number is also functional for any behavioral health related query. Additional resources can also be accessed on NCDC website.

Way forward

Both primary and secondary prevention are important in disease control. We present the way forward by identifying specific actions under enhancing preparedness and response, enabling care for patients, and broadening community and stakeholder engagement. The following no-regret moves can be considered. These moves complement the government’s efforts and its response to the disease.

Enhancing preparedness and response

1. The national government must continue to take the leadership role and providing the policy direction to the control efforts. It should issue regular updated guidance on implementation and action to be undertaken at the various levels of the health system
2. The state governments must align with the overall country efforts and ensure adherence to the guidelines and augment containment efforts. State should assume the lead in ensuring continuity of clinical and testing supplies as well as PPEs at the facility level within the state
3. The national government must design an intensive strategy for “hot” districts with active disease clusters/those which reported several cases. Review the situation district-wise to limit geographic spread
4. A “war-room” must be set up within all the districts at the collectorate and it should be adequately staffed 24 × 7. The district administration across the country will have to lead

the disease control efforts within respective districts and prepare a district plan for handling the situation within the district. The capacity to make and implement decisions at the collectorate will need priority attention. Proactive and strategic approach at the district level leadership will be the key to halting the spread of the disease and reversing the trend in cases

5. District administration must expand efforts for tracing all the contacts/suspects and testing for the disease wherever indicated by current testing protocols. At the district level, the health department along with the civic bodies such as the municipal corporations should actively and promptly undertake contact tracing. An early telephonic call should emphasize on immediate home precautions and should be followed by a home visit to emphasize important issues and mitigate anxiety
6. Maintain strict surveillance of suspect cases and contacts of confirmed cases. Surveillance will have to be supported by local residents and the community. In urban areas, residents welfare associations/housing societies will have to assume greater responsibility
7. Research in the epidemiology, clinical management of cases, and control measures must be promptly designed, implemented, and published. We need a detailed assessment of the natural history of the disease in the Indian population and the seroprevalence of COVID-19 within the population. Research to document the efficacy of treatment modalities and various drugs must be prioritized. These research efforts should be coordinated by the Indian Council of Medical Research at the national level. This research can guide interventions and responses in the future weeks.

Enabling care for patients

8. Identify dedicated facilities for treatment of COVID-19 positive cases. Ensure adequate number of beds and ventilators for serious patients needing ventilator support
9. Procure PPE and N95 masks in adequate numbers. Maintain a buffer stock for at least 2 weeks at the district level for all facilities handling COVID-19 suspect or confirmed cases
10. We must strengthen sample collection within the districts with clear linkages to testing centers within the district or to the nearest testing centers. This will shorten the time for obtaining test results
11. Identify and depute dedicated, adequate, and competent specialists and other health staff to manage clinical cases
12. Expedite trainings in case management as per the latest ministry guidelines.

Broadening community and stakeholder engagement

13. Maintain emphasis on supporting government efforts through a broad-based partnership with voluntary organizations, civil society, and nongovernmental organizations. Engage private sector hospitals and medical/nursing colleges with defined roles and responsibilities. Assign greater responsibility to medical/nursing colleges,

both public and private, with accountability mechanisms

14. Engage the industry and private sector to scale up production of health commodities which will be useful in combating the spread of the disease. Leverage private sector to help set up and manage call centers to help with contact tracing and other disease control activities
15. While specific protection (vaccine) is currently unavailable, health promotion will have to continue to be the mainstay of primary prevention. Maintain emphasis on IEC activities during all phases of the pandemic

As of 30 April, we are still in a lockdown period. The post-lockdown strategy will have to be influenced by the evolution of the country situation this week and the presence of “hot-spots” of disease within the districts. These decisions could depend on the case-load and disease transmission dynamics within the districts. The metrics for the decision-making will have to be developed and decisions will have to be driven by data. In districts fit for relaxation in the lockdown, states may have to seal that particular district’s borders with other districts while permitting partial relaxation of the lockdown within the district itself.

These are unprecedented times globally and within India. There is no perfect full-proof answer unless we can foretell the situation in the coming weeks. The decisions that are made in the coming 2 weeks will be crucial from India’s standpoint. We have taken a proactive and definitive action as a country in order to mitigate the health impact on our country. The slow rise of cases at this stage is an encouraging sign when compared to other countries which witnessed a rapid rise of case numbers at similar time-periods into the disease. We will have to maintain this positive momentum in control efforts through a combination of valid science, prompt testing, comprehensive quarantine/isolation with continued community support.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

REFERENCES

1. Guo YR, Cao QD, Hong ZS, Tan YY, Chen SD, Jin HJ, *et al.* The origin, transmission and clinical therapies on coronavirus disease 2019 (COVID-19) outbreak – An update on the status. *Mil Med Res* 2020 13;7:11.
2. Yin Y, Wunderink RG. MERS, SARS and other coronaviruses as causes of pneumonia. *Respirol Carlton Vic* 2018;23:130-7.
3. Zhou P, Yang XL, Wang XG, Hu B, Zhang L, Zhang W, *et al.* A pneumonia outbreak associated with a new coronavirus of probable bat origin. *Nature* 2020;579:270-3.
4. Zhang T, Wu Q, Zhang Z. Pangolin homology associated with 2019-nCoV. *bioRxiv* 2020.02.19.950253; 2020. Available from: <https://www.biorxiv.org/content/10.1101/2020.02.19.950253v1>. [Last accessed on 2020 Apr 04].
5. Chan JF, Yuan S, Kok KH, To KK, Chu H, Yang J, *et al.* A familial cluster of pneumonia associated with the 2019 novel coronavirus indicating person-to-person transmission: A study of a family cluster. *Lancet* 2020;395:514-23. Available from: <https://linkinghub.elsevier.com/retrieve/pii/S0140673620301549>. [Last accessed on 2020 Apr 01].

6. Q and A on Coronaviruses (COVID-19). Available from: <https://www.who.int/news-room/q-a-detail/q-a-coronaviruses>. [Last accessed on 2020 Apr 01].
7. Revised Guidelines on Clinical Management of COVID-19. Available from: <https://www.mohfw.gov.in/pdf/RevisedNationalClinicalManagementGuidelineforCOVID1931032020.pdf>. [Last accessed on 2020 Apr 02].
8. Role of Frontline Workers in Prevention and Management of Coronavirus. Available from: <https://www.mohfw.gov.in/pdf/PreventionandManagementofCOVID19FLWEnglish.pdf>. [Last accessed on 2020 Apr 01].
9. Clinical Protocols for the Diagnosis and Treatment of COVID-19 V7. Available from: http://english.www.gov.cn/2020special/5e32830ec6d019625c60433b/202003/26/content_WS5e7c6347c6d0c201c2cbf855.html. [Last accessed on 2020 Apr 01].
10. What you need to know about coronavirus disease 2019 (COVID-19); Available from: <https://www.cdc.gov/coronavirus/2019-ncov/downloads/2019-ncov-factsheet.pdf>. [Last accessed on 2020 Apr 01].
11. Santarpia JL, Rivera DN, Herrera V, Morwitzer MJ, Creager H, Santarpia GW, et al. Transmission potential of SARS-CoV-2 in viral shedding observed at the university of nebraska medical center. medRxiv 2020.03.23.20039446; 2020. Available from: <https://www.medrxiv.org/content/10.1101/2020.03.23.20039446v2>. [Last accessed on 2020 Apr 04].
12. Van Doremalen N, Bushmaker T, Morris DH, Holbrook MG, Gamble A, Williamson BN, et al. Aerosol and Surface Stability of SARS-CoV-2 as Compared with SARS-CoV-1. N Engl J Med 2020;382:1564-1567. Available from: <https://doi.org/10.1056/NEJMc2004973>. [Last accessed on 2020 Apr 04].
13. Report of the WHO-China Joint Mission on Coronavirus Disease 2019 (COVID-19). Available from: <https://www.who.int/docs/default-source/coronaviruse/who-china-joint-mission-on-covid-19-final-report.pdf>. [Last accessed on 2020 Apr 01].
14. Do Weather Conditions Influence the Transmission of the Coronavirus (SARS-CoV-2)? Available from: <https://www.cebm.net/covid-19/do-weather-conditions-influence-the-transmission-of-the-coronavirus-sars-cov-2/>. [Last accessed on 2020 Apr 06].
15. COVID-19 – Virtual Press Conference; 27 March, 2020. Available from: https://www.who.int/docs/default-source/coronaviruse/transcripts/wh-o-audio-emergencies-coronavirus-press-conference-full-27mar2020.pdf?sfvrsn=4b72eab2_2. [Last accessed on 2020 Apr 06].
16. COVID-19 situation reports [Internet]. Available from: <https://www.who.int/emergencies/diseases/novel-coronavirus-2019/situation-reports>. [Last accessed on 2020 Apr 30].
17. Early Transmission Dynamics in Wuhan, China, of Novel Coronavirus–Infected Pneumonia. Available from: https://www.nejm.org/doi/10.1056/NEJMoa2001316?url_ver=Z39.88-2003&rfr_id=ori:rid:crossref.org&rfr_dat=cr_pub%3dwww.ncbi.nlm.nih.gov. [Last accessed on 2020 Apr 06].
18. Prem K, Liu Y, Russell TW, Kucharski AJ, Eggo RM, Davies N, et al. The effect of control strategies to reduce social mixing on outcomes of the COVID-19 epidemic in Wuhan, China: A modelling study. Lancet Public Health 2020;S2468-2667:30073-6. doi:10.1016/S2468-2667(20)30073-6. Available from: [https://www.thelancet.com/journals/lanpub/article/PIIS2468-2667\(20\)30073-6/abstract](https://www.thelancet.com/journals/lanpub/article/PIIS2468-2667(20)30073-6/abstract). [Last accessed on 2020 Apr 06].
19. Antimicrobial Spectrum and Characteristics of Hand-Hygiene Antiseptic Agents. MMWR Morb Mortal Wkly Rep 2002;51:45.
20. Pan X, Chen D, Xia Y, Wu X, Li T, Ou X, et al. Asymptomatic cases in a family cluster with SARS-CoV-2 infection. Lancet Infect Dis 2020;20:410-1. Available from: [https://www.thelancet.com/journals/laninf/article/PIIS1473-3099\(20\)30114-6/abstract](https://www.thelancet.com/journals/laninf/article/PIIS1473-3099(20)30114-6/abstract). [Last accessed on 2020 Apr 06].
21. Rothe C, Schunk M, Sothmann P, Bretzel G, Froeschl G, Wallrauch C, et al. Transmission of 2019-nCoV Infection from an Asymptomatic Contact in Germany [Internet]. New England Journal of Medicine 2020;382:970-1. doi: 10.1056/NEJMc2001468. Available from: <https://www.nejm.org/doi/10.1056/NEJMc2001468>. [Last accessed on 2020 Apr 02].
22. Kimball A. Asymptomatic and Presymptomatic SARS-CoV-2 Infections in Residents of a Long-Term Care Skilled Nursing Facility — King County, Washington, March 2020. MMWR Morb Mortal Wkly Rep 2020;69:377-81. Available from: <https://www.cdc.gov/mmwr/volumes/69/wr/mm6913e1.htm>. [Last accessed on 2020 Apr 06].
23. Zou L, Ruan F, Huang M, Liang L, Huang H, Hong Z, et al. SARS-CoV-2 viral load in upper respiratory specimens of infected patients. N Engl J Med 2020;382:1177-9.
24. CDC. Recommendation Regarding the Use of Cloth Face Coverings, Especially in Areas of Significant Community-Based Transmission. Centers for Disease Control and Prevention; 2020. Available from: <https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/cloth-face-cover.html>. [Last accessed on 2020 Apr 06].
25. Population, Total. Data. Available from: <https://data.worldbank.org/indicator/SP.POP.TOTL>. [Last accessed on 2020 Apr 02].
26. Global Health Observatory Data Repository. Available from: <https://apps.who.int/gho/data/view.main.POP2040ALL?lang=en>. [Last accessed on 2020 Apr 02].
27. Della SM. Covid-19 – Situation in Italy. Available from: <http://www.salute.gov.it/portale/nuovocoronavirus/dettaglioContenutiNuovoCoronavirus.jsp?lingua=italiano&id=5351&area=nuovoCoronavirus&menu=vuoto>. [Last accessed on 2020 Apr 20].
28. Chronology of Main Steps and Legal Acts Taken by the Italian Government for the Containment of the COVID-19 Epidemiological Emergency. Available from: <http://www.protezionecivile.gov.it/documents/20182/1227694/Summary+%20of+measures+taken+against+the+spread+of+C-19/c16459ad-4e52-4e90-90f3-c6a2b30c17eb>. [Last accessed on 2020 Apr 01].
29. Number of Coronavirus (COVID-19) Cases and Risk in the UK. GOV.UK. Available from: <https://www.gov.uk/guidance/coronavirus-covid-19-information-for-the-public>. [Last accessed on 2020 Apr 20].
30. Coronavirus Action Plan: A Guide to What You Can Expect Across the UK. GOV.UK. Available from: <https://www.gov.uk/government/publications/coronavirus-action-plan/coronavirus-action-plan-a-guide-to-what-you-can-expect-across-the-uk>. [Last accessed on 2020 Apr 02].
31. CDC. Coronavirus Disease 2019 (COVID-19): Testing in the U.S. Centers for Disease Control and Prevention; 2020. Available from: <https://www.cdc.gov/coronavirus/2019-ncov/cases-updates/testing-in-us.html>. [Last accessed on 2020 Apr 20].
32. CDC. Coronavirus Disease 2019 (COVID-19). Centers for Disease Control and Prevention; 2020. Available from: <https://www.cdc.gov/coronavirus/2019-ncov/cases-updates/cdc-in-action.html>. [Last accessed on 2020 Apr 02].
33. COVID 19 Epidemiological Point; 2020. Available from: <https://www.santepubliquefrance.fr/recherche/#search=COVID-19%20:%20point%20epidemiologique> and sort = date. [Last accessed on 2020 Apr 20].
34. Coronavirus Covid 19 – English. Available from: <https://www.gouvernement.fr/en/coronavirus-covid-19>. [Last accessed on 2020 Apr 01].
35. Robert Koch Institute. Available from: https://www.rki.de/EN/Home/homepage_node.html. [Last accessed on 2020 Apr 20].
36. Corman VM, Landt O, Kaiser M, Molenkamp R, Meijer A, Chu DK, et al. Detection of 2019 novel coronavirus (2019-nCoV) by real-time RT-PCR. Eurosurveillance 2020;25:2000045. Available from: <https://www.eurosurveillance.org/content/10.2807/1560-7917.ES.2020.25.3.2000045>. [Last accessed on 2020 Apr 02].
37. KCDC. Available from: http://www.cdc.go.kr/cdc_eng/. [Last accessed on 2020 Apr 20].
38. Risk Assessment Raised to Dorscon Orange- MOH- SINGAPORE; 2020. Available from: <https://www.moh.gov.sg/news-highlights/details/risk-assessment-raised-to-dorscon-orange>. [Last accessed on 2020 Apr 02].
39. Promulgation of Regulations under Infectious Diseases Act-MOH-Singapore. Available from: <https://www.moh.gov.sg/news-highlights/details/promulgation-of-regulations-under-infectious-diseases-act>. [Last accessed on 2020 Apr 02].
40. Update on Novel Coronavirus: One Positive Case Reported in Kerala. Available from: <https://pib.gov.in/newsite/PrintRelease.aspx?relid=197858>. [Last accessed on 2020 Mar 31].
41. Ministry of Health and Family Welfare. GOI RSS. Available from:

- <https://www.mohfw.gov.in/>. [Last accessed on 2020 Apr 01].
42. MHA Order on Disaster Management Act 2005. Available from: https://mha.gov.in/sites/default/files/MHA%20Order%20on%20%20Disaster%20Management%20Act%202005_0.pdf. [Last accessed on 2020 Apr 03].
 43. Health Ministry Reviews Preparedness for Novel Corona Virus (nCoV). Available from: <http://pib.gov.in/Pressreleaseshare.aspx?PRID=1599665>. [Last accessed on 2020 Mar 31].
 44. Containment Plan for Large Outbreaks Novel Coronavirus Disease 2019 (COVID-19). Available from: <https://www.mohfw.gov.in/pdf/3ContainmentPlanforLargeOutbreaksofCOVID19Final.pdf>. [Last accessed on 2020 Apr 15].
 45. Total Operational (initiated independent testing) Government Laboratories reporting to ICMR: 2020. Available from: https://www.icmr.gov.in/pdf/covid/labs/Govt_Labs_29042020.pdf. [Last accessed on 2020 Apr 30].
 46. List of Private Laboratories to test COVID-19. 2020. Available from: https://www.icmr.gov.in/pdf/covid/labs/Pvt_Labs_28042020.pdf. [Last accessed on 2020 Apr 30].
 47. SARS-CoV-2 (COVID-19) Testing: Status Update 30 April 2020. Available from: https://www.icmr.gov.in/pdf/covid/update/ICMR_testing_update_30Apr2020_9AM_IST.pdf. [Last accessed on 2020 Apr 30].
 48. Strategy for COVID19 Testing in India (Version 4, dated 09/04/2020). Available from: https://icmr.nic.in/sites/default/files/upload_documents/Strategey_for_COVID19_Test_v4_09042020.pdf. [Last accessed on 2020 Apr 15].
 49. Guidance on the use of Truenat™ Beta CoV. Available from: https://icmr.nic.in/sites/default/files/upload_documents/Guidance_TrueNat_14042020.pdf. [Last accessed on 2020 Apr 15].
 50. Production capacity of coveralls required by medical personnel treating COVID-19 cases in the country has been ramped up to more than 1 lakh per day; cumulative production till date is approximately one million coverall units. Available from: <https://pib.gov.in/newsite/PrintRelease.aspx?relid=202579>. [Last accessed on 2020 Apr 27].
 51. India has acquired enough strength and resources to take on the worst challenge thrown by the corona virus: Dr. Harsh Vardhan. Available from: pib.gov.in/Pressreleaseshare.aspx?PRID=1617656. [Last accessed on 2020 Apr 27].
 52. GoM Reviews Current Status, and Actions for Management of COVID-19; 2020. Available from: <https://pib.gov.in/PressReleaseDetail.aspx?PRID=1606637>. [Last accessed on 2020 Apr 02].