

## Review Article

# An overview of corona virus disease 19 - COVID 19

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### ABSTRACT

A remerging infectious disease that has caught the entire world unaware. Coronavirus is an enveloped virus having non- segmented positive-sense RNA genome and belongs to the family Coronaviridae. Important modes of transmission are direct contact and respiratory droplets. Though the virus survives on environmental surfaces for varied period of time, it gets easily inactivated by chemical disinfectants. The major clinical features in uncomplicated cases include fever (88%), dry cough (67%), myalgia (14.9%) or fatigue (38%). In the absence of an effective treatment and vaccine, preventive measures like physical distancing, hand hygiene, following respiratory etiquettes & wearing mask assume great importance. Vigorous surveillance, contact tracing and containment can go a long way in controlling the spread of Covid 19.

**Keywords:** COVID 19, Coronavirus, SARS CoV 2 sinus

### INTRODUCTION

Throughout history, nothing has killed more human beings than infectious diseases. Epidemics and pandemics have ravaged humanity throughout its existence, often changing the course of history and at times even signaling the end of entire civilization. Evolving, reemerging and adaptive pathogens have always been a constant threat to global public health.<sup>1</sup> One such threat that has created a great havoc and devastated mankind in the recent decades is Corona virus which is a family of enveloped RNA viruses that are distributed broadly among humans, other mammals, and birds which cause respiratory, enteric, hepatic, and neurologic diseases.<sup>2,3</sup>

The outbreak caused by SARS CoV (Severe Acute Respiratory Syndrome) in 2002-03 demonstrated that animal coronaviruses could jump the species barrier and turn into a pandemic threat infecting thousands of people across the globe and killing hundreds. Another highly pathogenic coronavirus was recognized a decade later in 2012 as MERS CoV (Middle East Respiratory syndrome)

which caused explosive nosocomial transmission and more than 800 deaths in the middle-east till date. A third strain of coronavirus, SARS CoV 2 has been identified in the current outbreak which started in early December of 2019 in the city of Wuhan in the Hubei Province of China. Cases continued to increase exponentially affecting more than 210 countries of the world with number of cases and deaths exceeding that of China, which was the epicentre of the outbreak at first.<sup>4</sup> A brief timeline is seen in Figure 1.

### REVIEW OF LITERATURE

#### *Epidemiology*

##### *Agent*

Coronaviruses, are spherical in shape with club- shaped spike projections emanating from the surface which look like halos or a crown under the electron microscope and hence the name coronavirus.<sup>5</sup> Coronavirus is an enveloped virus having non- segmented positive-sense RNA genome and belongs to the family Coronaviridae.<sup>6,7</sup>

They are further classified into four genera namely alpha, beta, gamma and delta, of which only alpha and beta varieties are known to cause infections in humans. Until recent decades, human coronaviruses were considered inconsequential pathogens rarely causing any disease more severe than the common cold.

However, relatively recently two new varieties of beta coronaviruses were discovered known as SARS CoV and MERS CoV, which are zoonotic in origin and found to cause severe lower respiratory disease with fatal consequences in humans.<sup>8</sup> The present outbreak of a coronavirus- associated acute respiratory disease called Covid-19 is the third documented spillover of an animal coronavirus to humans in only two decades that has resulted in a major pandemic.

The structure of the receptor-binding gene region is very similar to that of the SARS coronavirus, and the virus has been shown to use the same receptor, the angiotensin-converting enzyme 2 (ACE2), for cell entry.<sup>9</sup> SARS and MERS-CoV-2 were reported to have a 10% and 34.4% case fatality rate, respectively.<sup>10</sup> In contrast, SARS-CoV-2 has been estimated to have a case fatality rate of ~2.3%.<sup>11</sup>

*Host factors*

Coronavirus infections can affect all ages and both genders. Based on currently available information and clinical expertise, older adults and people of any age who have serious underlying medical conditions might be at higher risk for severe illness from COVID-19.

Number of cases in pediatric populations is few, usually having milder symptoms and better prognosis.<sup>12</sup>

*Environmental factors*

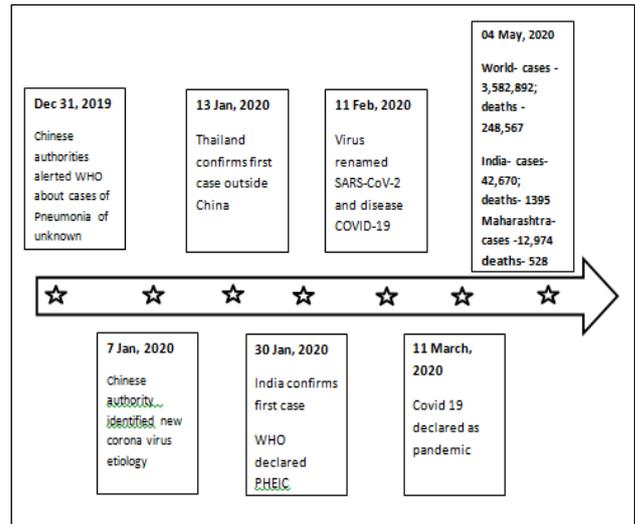
Much remains unknown about SARS -CoV 2, the virus that causes COVID 19 is affected by environmental factors.

*Modes of transmission*

Transmission of the COVID-19 virus can occur by direct contact with infected people and indirect contact with surfaces in the immediate environment or with objects used by the infected person.<sup>13</sup> The basic reproductive number ("R0"), a measure of the expected number of cases that is generated from one case, is estimated to be 1.5-3.0 for SARS-CoV-2, as opposed to 0.5-1.0 and 1.5-4.0 with MERS-CoV-2 and SARS, respectively.<sup>14,15</sup>

*Incubation period*

Most estimates of incubation period for Covid 19 range from 2 to 14 days, with the average incubation period being 5 days.

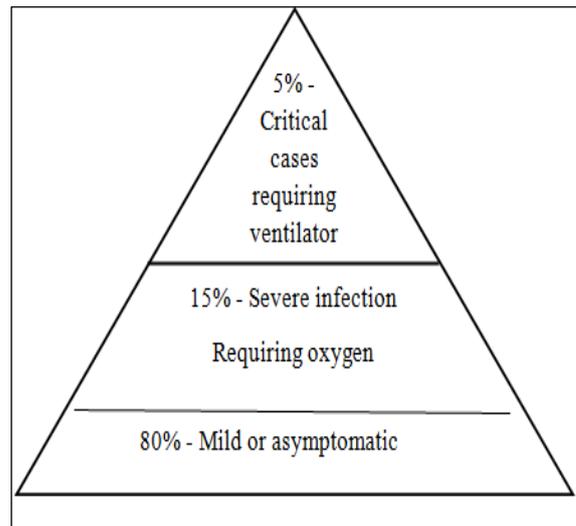


**Figure 1: Timeline for Covid 19 pandemic.**

*Clinical features*

*Clinical manifestations*

The complete clinical manifestation is not clear yet, as the reported symptoms range from mild to severe figure 2, with some cases even resulting in death.<sup>16</sup> The most commonly reported symptoms in uncomplicated cases are fever (88%), dry cough (67%), myalgia (14.9%) or fatigue (38%), whereas less common reported symptoms include headache, diarrhea, hemoptysis, runny nose, and phlegm-producing cough.<sup>17</sup> However many asymptomatic persons have also tested positive for Covid 19 and such subclinical cases make early detection difficult. Another presentation is in the form of Mild pneumonia. Those with severe pneumonia may present with respiratory infection and one of findings as, respiratory rate >30 breaths/min, severe respiratory distress, SpO2 <90% on room air.



**Figure 2: Spectrum of illness of Covid 19.**

Patients having ARDS present with the following:

*Onset*

New or worsening respiratory symptoms within one week of known clinical insult.

*Chest imaging (radiograph, CT scan, or lung ultrasound)*

Bilateral opacities, not fully explained by effusions, lobar or lung collapse, or nodules.

*Origin of oedema*

Respiratory failure not fully explained by cardiac failure or fluid overload.

*Categorisation of ARDS as per Oxygenation (adults)*

- Mild ARDS:  $200 \text{ mmHg} < \text{PaO}_2/\text{FiO}_2 \leq 300 \text{ mmHg}$  (with PEEP or CPAP  $\geq 5 \text{ cm H}_2\text{O}$ , or non-ventilated)
- Moderate ARDS:  $100 \text{ mmHg} < \text{PaO}_2/\text{FiO}_2 \leq 200 \text{ mmHg}$  with PEEP  $\geq 5 \text{ cm H}_2\text{O}$ , or non-ventilated)
- Severe ARDS:  $\text{PaO}_2/\text{FiO}_2 \leq 100 \text{ mmHg}$  with PEEP  $\geq 5 \text{ cm H}_2\text{O}$ , or non-ventilated)
- When  $\text{PaO}_2$  is not available,  $\text{SpO}_2/\text{FiO}_2 \leq 315$  suggests ARDS (including in non-ventilated patients)

Life-threatening organ dysfunction caused by a dysregulated host response to suspected or proven infection are features of sepsis. Those who land in septic shock with persisting hypotension despite volume resuscitation require vasopressors to maintain MAP  $\geq 65 \text{ mmHg}$  and serum lactate level  $< 2 \text{ mmol/L}$ .<sup>18</sup>

**Laboratory diagnosis**

Sample (Oropharyngeal & nasal swab) should be collected, taking all appropriate bio safety and bio security precautions. Only real time PCR assays are recommended.

*Whom to test: (Revised testing strategy)<sup>19</sup>*

- All symptomatic persons
  - Within 14 days of international travel
  - Contacts of laboratory confirmed cases
  - Health care workers
- All hospitalized patients with SARI
- Asymptomatic
  - Direct and
  - High-risk contacts of a confirmed case between day 5 and 14

*As per MoHFW, in hotspots/cluster and in large migration gatherings/evacuees centre*

- All symptomatic ILI (fever, cough, sore throat, runny nose)
  - Within 7 days of illness - rRT-PCR
  - After 7 days of illness - Antibody test (if -ve, confirm by rRT-PCR)

**Management**

Early supportive therapy and monitoring constitutes giving supplemental oxygen, conservative fluid management and giving empiric anti-microbial. Corticosteroids should be avoided unless they are indicated for another reason. Patient should be closely monitored and the co morbid condition should be properly understood to customize the management accordingly.

There is no current evidence from RCTs to recommend any specific treatment for suspected or confirmed patients with COVID - 19.

No specific anti-virals are recommended for treatment of COVID - 19 due to lack of adequate evidence from literature.<sup>18</sup> Administration of Lopinavir/ Ritonavir is being considered in Laboratory confirmed cases of COVID - 19 along with Hydroxy chloroquine.

**Case definitions<sup>20</sup>**

*Suspected Case*

A person with acute respiratory illness of any severity who within past 14 days had any of the following exposures

- Close physical contact with a confirmed case of COVID-19 infection, while that patient was asymptomatic

or

- A health care facility in a country where hospital-associated COVID-19 infections have been reported
- SARI in a person with no other etiology that explains the clinical condition and h/o international travel in 14 days prior to symptom onset

or

- Disease occurs in a HCW working in an environment where SARI patients are being cared for

or

- Person develops unusual, unexpected clinical course like sudden deterioration despite appropriate treatment irrespective of history of travel

*Severe acute respiratory illness*

- ARI with history of fever (temp > or = 38 C), cough, onset within the last 10 days, requiring hospitalization

**Table 1: High and low risk contact.**

Type of contact	On the basis of touch	On the basis of proximity from case
High risk	Touched body fluids of the patient (Respiratory tract secretions, blood, vomit, saliva, urine, faeces)	Lives in the same household as the patient.
	Had direct physical contact with the body of the patient including physical examination without PPE	Anyone in close proximity (within 3 ft) of the confirmed case without precautions
	Touched or cleaned the linens, clothes, or dishes of the patient	Passenger in close proximity (within 3 ft) of a conveyance with a symptomatic person who later tested positive for COVID-19 for more than 6 hours
Low risk	-	Shared the same space (Same class for school/worked in same room/similar and not having a high-risk exposure to confirmed or suspect case of COVID-19)
	-	Travelled in same environment (bus/train/flight/any mode of transit) but not having a high-risk exposure

Note: This should include health workers (including those involved in cleaning, waste management, laboratory technicians, healthcare workers, etc.).

*Probable case*

- A suspect case for whom testing for COVID-19 is inconclusive

*Confirmed case*

- A person with laboratory confirmation of COVID-19 infection, irrespective of clinical signs and symptoms

*Contact is defined as<sup>20</sup>*

A contact is a person that is involved in any of the following

- Providing direct care without proper personal protective equipment (PPE) for COVID-19 patients
- Staying in the same close environment of a COVID-19 patient (including workplace, classroom, household, gatherings).
- Traveling together in close proximity (1 m) with a symptomatic person who later tested positive for COVID-19.

Criteria for calling a contact as high or low risk is seen in Table 1.

**Prevention and control**

*General advice*

- Social Distancing (physical) measures

Avoid close contact with people suffering from acute respiratory infections and follow social distancing as per recommendations. Closing educational establishments, postponing exams, encouraging work from home, holding meetings through video conferencing, closure of dine- in restaurants, postponement of all non-essential social and cultural gatherings like weddings, sporting events etc, keeping all religious places like mandir, masjid etc closed, regulating hours of market places like sabzi mandi, restricting travel and transport to minimum essential goods etc are some of the measures taken by the local authorities.

- Hand hygiene

Should be frequent with soap and water taking care that all the recommended steps are followed (minimum for 40 to 60 seconds) and if using alcohol-based hand rub the concentration of alcohol should not be less than 70 % and the duration should be minimum 20 sec.

- People with symptoms of acute respiratory infection should practice respiratory etiquette by sneezing or coughing in one’s sleeves or if using a tissue, it should be properly disposed in a covered bin. They

should also wear a medical mask and seek medical care.

Personal Protective Equipment (PPE) in health care setting<sup>21</sup>

Personal Protective Equipments (PPEs) are protective gears designed to safeguard the health of workers by minimizing the exposure to a biological agent. Components of PPE are goggles, face-shield, mask, gloves, coverall/gowns (with or without aprons), head cover and shoe cover.

Each component and rationale for its use is given in Table 2 and 3.

Points to remember while using PPE

- PPEs are not alternative to basic preventive public health measures such as hand hygiene, respiratory etiquettes which must be followed at all times.

- Always follow the laid down protocol for disposing off PPEs as detailed in infection prevention and control guideline available on website of MoHFW.
- Always (if possible) maintain a distance of at least 1 meter from contacts/suspects/confirmed COVID-19 cases.
- All healthcare workers must be advised to self-monitor their health and report any breach in IPC practices or occurrence of any illness.

**Blood and body substance spill management<sup>22</sup>**

Splashes of body fluids on walls and surfaces can be cleaned by using a high-level disinfectant.

- Use PPE (gloves, face masks and fluid-resistant gowns) for cleaning blood.
- For decontamination of small spills (<10 ml), if sodium hypochlorite solution is selected, use a 1:100 dilution (525–615 ppm of available chlorine) (Table 5.3).

**Table 2: Rationale for use of personal protective equipment in hospital area.**

Health care setting	Personnel	Activity	Type of PPE
Screening area	All staff	Temperature measurement not involving direct contact	N 95 mask Gloves
	All staff	Interviewing patients with clinical symptoms of COVID-19 and travel history	N 95 mask Gloves
Consultation room	Health care workers	Physical examination of patient with respiratory symptoms	Medical mask Gown Gloves Eye protection
	Patient with respiratory symptoms	Any	Medical mask
	Patient without respiratory symptoms	Any	No PPE
Waiting room	Patient with respiratory symptoms	Any	Medical mask
	Patient without respiratory symptoms	Any	No PPE
Patient room	Health care workers	Providing direct care to COVID-19 patient	Medical mask Gown Gloves Eye protection
		Performing aerosol generating procedures (tracheal intubation, tracheostomy, CPR, manual ventilation, bronchoscopy)	N-95 mask Gown Gloves Eye protection
Ambulance / Transfer vehicle	Health care workers	Transporting suspected COVID patient to referral facility	Medical mask Gown Gloves Eye protection

**Table 3: Personal protective equipments in community setting and in home quarantine.**

Setting	Activity	Risk	Recommended PPE	Remarks
ASHAs/ Anganwadi and other field staff	Field surveillance	Low risk	Triple layer mask gloves	Maintain distance of one meter. Surveillance team to carry adequate triple layer masks to distribute to suspect cases detected on field surveillance
Doctors at supervisory level conducting field investigation	Field surveillance Clinical examination.	Medium risk	N 95 mask gloves.	
Persons being quarantined		Low risk	Triple layer mask	
Designated family member	Taking care of person being quarantined	Low risk	Gloves	While cleaning commonly touched surfaces or handling soiled linen
Other family		No risk	No PPE required	Maintain a distance of at least 1 meter from person under home quarantine. Senior citizens in the household should stay away from such persons under home quarantine

**Table 4: Common cleaning agents and disinfectants for environmental cleaning.**

Disinfectants	Recommended use	Precautions
Sodium hypochlorite 1% in-use dilution; 5% solution to be diluted 1:5 in clean water	Disinfection of material contaminated with blood and body fluids	Should be used in well- ventilated areas Protective clothing required while handling and using undiluted Do not mix with strong acids to avoid release of chlorine gas Corrosive to metals
Bleaching powder 7g/L with 70% available chlorine	Toilets/ bathrooms - may be used in place of liquid bleach if this is unavailable	Same as above
Alcohol (70%) isopropyl, ethyl alcohol, methylated spirit	Smooth metal surfaces, table tops and other surfaces on which bleach cannot be used	Flammable, toxic – to be used in well-ventilated area, avoid inhalation Keep away from heat source, electrical equipment, flames, hot surfaces Allow it to dry completely, and avoid diathermy burns
Detergent with enzyme	Cleaning endoscopes, surgical instruments before disinfection is essential	

- If spills involve larger amounts of blood, or involve a spill of microbiology cultures in the laboratory, a 1:10 dilution of hypochlorite solution for first application (before cleaning) reduces the risk of infection during cleaning. After the first application, remove the visible organic matter with absorbent material (e.g. disposable paper towels), discard into leak-proof, labelled bag/ container and then dispose of as per waste management guidelines. Common cleaning

agents and disinfectants for environmental cleaning are depicted in Table 4.

#### **Biomedical waste management<sup>23</sup>**

Used PPEs such as goggles, face shield, splash proof apron, plastic cover all, hazmet suits, nitrile gloves should be collected in red bag. Used masks, head cover/cap, shoe cover, disposable linen gown, non-plastic

or semi plastic cover all should be collected in yellow bags.

### Hospital care<sup>24</sup>

All suspect/confirmed COVID-19 cases will be hospitalized and kept in isolation in dedicated COVID-19 hospitals/hospital blocks. Persons testing positive for COVID-19 will remain hospitalized till such time as two of their samples are tested negative as per discharge policy. About 15% of the patients are likely to require hospitalization, and an additional 5 % will requires ventilator management.

A three tier arrangement for managing suspect/confirmed cases will be implemented to decrease burden on the COVID Block/ hospital.

All 3 types of COVID Dedicated facilities will have separate ear marked areas for suspect and confirmed cases. Suspect and confirmed cases should not be allowed to mix under any circumstances.

The COVID Care Centers shall offer care only for cases that have been clinically assigned as mild or very mild cases or COVID suspect cases.

The COVID Care Centers are makeshift facilities These may be set up in hostels, hotels, schools, stadiums, lodges etc., both public and private.

Dedicated COVID Care Centre must necessarily be mapped to one or more Dedicated COVID Health Centres and at least one Dedicated COVID Hospital for referral purpose.

### Dedicated COVID health centre (DCHC)

The Dedicated COVID Health Centre are hospitals that shall offer care for all cases that have been clinically assigned as moderate. These should either be a full hospital or a separate block in a hospital with preferably separate entry\exit/zoning.

### Dedicated COVID hospital (DCH)

The Dedicated COVID Hospitals are hospitals that shall offer comprehensive care primarily for those who have been clinically assigned as severe.

### Emergency ICD-10 codes for COVID-19 by the WHO<sup>25</sup>

#### Emergency ICD-10 Code

U07.1: COVID-19, virus identified

U07.2: COVID-19, virus not identified, Clinically-epidemiologically diagnosed COVID-19 Probable COVID-19, Suspected COVID-19.

### Containment measures<sup>26</sup>

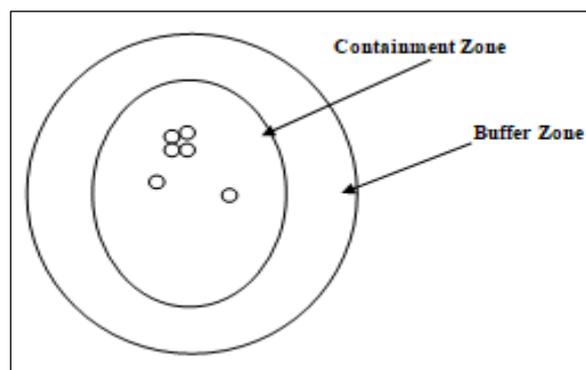


Figure 3: Containment and buffer zone.

- Defined based on
  - Index case / cluster, which will be the designated epicenter
  - Listing and mapping of contacts
  - Geographical distribution of cases and contacts around the epicenter
  - Administrative boundaries within urban cities /town/ rural area
- Perimeter of the containment zone will be decided by the District administration.
- Clear entry and exit points will be established

### Buffer zone

Area around the Containment Zone, where new cases most likely to appear

### Activities in containment

- Perimeter control
- Active search for cases
- Testing of all cases as per sampling guidelines

### Activities in buffer zones

- No perimeter control
- No active search for cases
- ILI/SARI cases report to health institutions falling in the buffer zone & testing of ILI/SARI cases reporting to health institutions falling in the buffer zone.

### Guidelines for home quarantine

- Applicable to all contacts of suspect or confirmed cases of COVID-19
- Stay in single, well-ventilated room with attached washroom
- Stay away from elderly, children, pregnant women and those with co-morbidity

- Restrict any movement within house and sharing of household items
- Hand-washing
- Wear surgical mask all the time. Change mask every 6-8 hrs
- Mask discarded in yellow biohazard bag (New COVID-19 BMW rules)
- Touched surfaces disinfected with 1% sodium hypochlorite
- Report to Hospital if any symptoms develop

### **Surveillance**

#### *Surveillance period - 28 days*

- 14 days quarantine at home or hospital or a designated facility
- Next 14 days for self-reporting

#### *Testing*

- All high risk contacts to be tracked, quarantined and lab-tested as per the protocol.
- For low risk contacts - lab-test only when the person develops symptoms.

#### *Indian nationals*

- Irrespective of location of the health care facility where the suspect/confirmed case is admitted, it will be included in the line list of the State where the case resided during the last 14 days (prior to or after the onset of the symptoms).

#### *Foreign nationals*

- An individual or a group of foreign nationals if found positive and admitted in a designated health facility in a particular State, that state to include such foreigners in its line list.

#### *Contact tracing*

- Enlist all the contacts with their names, address and contact details
- Daily visit to check if contact develops any fever, cough, shortness of breath, difficulty in breathing
- Educate contacts and their family members on importance of contact tracing and home quarantine
- Inform contacts to report immediately if they develop symptoms
- Follow-up for 28 days from the time of last contact with a case
- A positive case may have contacts in multiple States/UTs.
- Tracking of all the contacts located in a particular State/UT will be the responsibility of that State/UT.

- In case of any high risk contact found in the particular State/UT, sampling to be carried out by respective State/UT along with Home/Hospital quarantine of the said contact.

### **Chemoprophylaxis<sup>27</sup>**

#### *Hydroxychloroquine prophylaxis*

- Asymptomatic HCWs in the care of suspected/confirmed COVID-19 patients
- Dose - 400mg BD on Day 1, once a week for next 7 weeks
- Asymptomatic household contacts of lab-confirmed cases
- Dose - 400mg BD on Day 1, once a week for next 3 weeks
- Exclusions - children <15 yrs, k/c/o retinopathy and hypersensitivity to HCQ and 4-aminoquinoline compounds

### **Dead body disposal<sup>28</sup>**

The health worker attending to the dead body should perform hand hygiene, ensure proper use of complete PPE. All tubes, drains and catheters on the dead body should be removed, all puncture holes or wounds (resulting from removal of catheter, drains, tubes, or otherwise) should be disinfected with 1% hypochlorite and dressed with impermeable material.

Oral, nasal orifices of the dead body should be plugged to prevent leakage of body fluids. The dead body should be placed in leak-proof plastic body bag and the exterior of the body bag should be cleaned with 1% hypochlorite. The body bag should be wrapped with a mortuary sheet or sheet provided by the family members.

Viewing of the dead body by unzipping the face end of the body bag (by the staff using standard precautions) may be allowed, for the relatives to see the body for one last time. Religious rituals such as reading from religious scripts, sprinkling holy water and any other last rites that does not require touching of the body can be allowed. Bathing, kissing, hugging, etc. of the dead body should not be allowed.

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