

COVID-19: Dead Body Management

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Abstract

The pandemic of COVID-19 has posed many challenges to the medical fraternity and those involved in handling dead bodies. The challenge of dead body management has been devastating to humankind due to the enormous numbers of dead bodies in this pandemic. People get panicked while dealing with the dead bodies having infection of Severe Acute Respiratory Syndrome Coronavirus-2 [SARS-CoV-2]. Deaths occurred in such big numbers that facilities were outnumbered by the magnitude of deaths. The idea of writing this paper is the concise dissemination of knowledge about the safety of the persons involved in dealing with the dead bodies so that proper preventive measures can be taken, and that too in such a manner so that the respect for the dead body or dignity of the dead body is not compromised. Forensic pathologists are to deal with post-mortem examination cases that pose special hazards as they are more exposed to infection e.g., coming in contact with body fluids and aerosol formed during post-mortem examination. Now there is a gradual change from a panic reaction to the scientific disposal of the dead bodies thus giving proper dignity to the dead body. The scenario has changed from no autopsy in such cases to autopsy after taking proper precautions under the national guidelines.

Keywords

COVID-19; SARS-CoV-2; Dead body management; Autopsy; Cremation; Burial; Infection control.

Introduction

Deaths due to COVID-19 may take place at homes, on the way to health care facilities or in the health care facilities. At one stage a condition of helplessness had been seen due to a large number of deaths in this pandemic and poor knowledge at the beginning of this pandemic causing a panic in the population due to available facilities being overtaken by the effects of the pandemic. Populations suffered psychological effects when the dead bodies were deserted even by the close relatives and the whole burden of the disposal of the dead bodies was put on the health care providers.

Gradually guidelines were issued by the various agencies from time to time to handle the infected dead bodies and to conduct the post-mortem examination of cases of COVID-19. There are guidelines issued by the World Health Organization [WHO]¹, Red Cross², European Centre for Disease Prevention & Control.³ Government of India, Department of Health and Family Welfare⁴ and Government of Punjab⁵ and orders issued by other states.⁶⁻⁸

COVID-19 is considered a highly contagious disease and one study reported contracting this disease from the dead body as high as 27.8%.⁹ Even the dead bodies were mishandled in the

hospitals and graveyards due to the fear of contracting the infection. There was not sufficient place to bury and sufficient resources to cremate such dead bodies resulting in mass burials or mass cremations, visuals of which caused big stress on the minds of the communities.¹⁰⁻¹² This happened not just in India but even in the most developed nations like the USA where mass burial was done.^{13,14} There was a shortage of space even in the morgues in the USA¹⁵ and other parts of the world.¹⁶

Guidelines are usually issued by the governments and different organizations depending upon the current scientific knowledge at that particular time. These guidelines are modified too with the advent of new knowledge. These guidelines will help all those who are going to deal with the dead bodies having a suspicion or confirmation of having infection of SARS-CoV-2. The persons who will be benefitted from these guidelines are health workers, those involved with transportation and storage of the dead bodies, police officials, religious people and those involved with the final disposal of the dead body i.e., those involved with cremation, burial or any other form of final disposal of the dead body.

The Punjab government also issued guidelines and doctors in Punjab are following these guidelines. These guidelines were issued in 2020 April. These guidelines have been developed keeping in mind that this disease is spread by the droplets. It mentions the standard precautions by the healthcare workers who are going to handle the dead body. It mentions the precautions to be taken while removing the dead body from the isolation area, transporting it to the mortuary, handing it over to relatives or police officials, transporting the dead body and cremating or burying the dead body.⁵

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In medicolegal cases, autopsies are needed to find out the cause of death in addition to fulfilling the other aims and objectives of conducting the autopsies. Management of the dead bodies especially during mass disasters in the pandemic is a big issue that can affect the psyche of the people. It needs identification of the dead bodies, proper storage and proper disposal of the dead body in a dignified manner. This pandemic should teach the governments to prepare plans for managing the dead bodies in mass disasters, especially during pandemics.¹⁷

Standard precautions

These include hand hygiene, use of Personal Protective Equipment [PPE], disinfecting body bags from outside, and disinfecting all linens and environmental surfaces and safely handling the sharps.^{4,5}

Hand Hygiene

Hand hygiene includes avoiding unnecessary touching of surfaces, washing hands with soap and water if hands are soiled and alcohol-based hand rub.¹⁸

Personal Protective Equipment

Personal Protective Equipment includes aprons & gowns that should be water-resistant, masks, gloves and eyewear.² Personal Protective Equipment is required when there is a danger of contamination by blood or body fluids. This PPE should be discarded before leaving the room or cubicle of the patient avoiding contamination of the skin while removing the kit and hand hygiene should be taken care of after discarding the gown.¹⁸

Gloves

Use of gloves is recommended when there are chances of contact with blood stool, urine, mucous membrane, non-intact skin or contaminated skin and contaminated fomites. Gloves should be changed when caring for another patient or contacting skin from an infectious skin even on the same patient.¹⁸

Mouth, nose and eye protection

For mouth, nose and eye protection appropriate masks, face shields and goggles should be used when splashes of blood, body fluids, secretions and excretions is expected.¹⁸

Cough etiquette and respiratory hygiene

Cough etiquette and respiratory hygiene should be followed in this disease as droplet infection can occur. Face masks and hand hygiene should be taken care of and notices out at various places to take care of these precautions.¹⁸ Tissues and no-touch receptacles should be provided. Mouth and nose should always be covered while coughing or sneezing. Soap should be provided at places where hand washing facilities are present and at other places, dispensers with alcohol-based hand rubs should be provided. A social distance of 3 feet should also be maintained while the epidemic is active.¹⁸

Linen

The linen used should be minimally agitated while handling to prevent the spread. Aerosol Contamination from the laundry should be avoided.¹⁸

Environmental cleaning and sanitation

Environmental cleaning and sanitation mean cleaning of all those surfaces where ever there are chances of the virus being present after the patient has been discharged or the dead body has been taken away. This includes furniture in the rooms. e.g., bed, tables, stools, IV stands and other; fittings of the bathroom, doors and handles, electrical switches and computers and their attachments, stethoscopes, cuffs of the BP apparatus, wheelchairs, Trolleys, incubators, railings, office tabletops, floors and walls. Viruses remain active for different periods on these surfaces. SOPs should be developed and followed according to the guidelines from the various agencies. Sodium Hypochlorite or Calcium Hypochlorite is commonly used. Sprays and soaked clothes are used to clean and disinfect. Floors should be cleaned last of all.¹⁹ This will help in the reduction of the spread of the infection even at the community paces like schools.²⁰

Handling of sharps

Handling of sharps should be done carefully to avoid pricks and sharps should be disposed of in the containers especially meant for these sharp objects. The protection of other health care workers is very important and should be taken care of by following the standard precautions.¹⁸

Training

Training of all health workers involved in the handling of the dead body is an important part of the prevention of the disease and should be given due importance to prevent the spread of the disease. All the members of the staff working in the isolation area, autopsy room, involved in the transportation of dead bodies, working in crematorium and burial process should be trained.⁴

Different precautions are advised at the different steps to handle the dead body. In some cases, post-mortem examination may be required. Post mortem examination is usually required in medicolegal cases to confirm or rule out foul play. Precautions needed, will be discussed at the different steps right from the taking out of the dead body from the isolation area in the hospital. Sometimes deaths may also occur at homes due to this disease and preventive measures will also be discussed in such scenarios too.

Post-mortem testing for CORONA-19

Doctors involved in the post-mortem examination, medical examiners and coroners can decide on the testing after considering the clinical picture of the deceased and the guidelines of the governments. A nasopharyngeal specimen

should be collected if an autopsy is not to be performed. If an autopsy is performed on the dead body, then a nasopharyngeal specimen and a specimen from the lungs should be taken.²¹

From isolation area

The body should be transferred to the mortuary as soon as possible¹. In addition to using standard safety precautions facial precautions should be used if there is a risk of splashes. All the catheters and inline tubing should be removed and if there is a danger of fluids coming from the body orifices these should be sealed. All the wounds should be sealed too with impermeable dressings. All body orifices should be plugged. Relatives should be allowed to see the body with due precautions. They should be counselled and their sentiments should be given respect. The body should be put in a leak-proof body bag and the bag should be cleaned with 1% Sodium Hypochlorite solution.⁴

Mortuary & storage

All the employees should follow the standard precautions mentioned above. Family persons too need these precautions if they wish to see the body but they should not be allowed to touch the body or kiss the body. The body should be stored in the body bag which has been duly disinfected.^{4,8} If the dead bodies are to be stored these should be stored at 4⁰ C. When the body has been removed Chamber door and handles should be cleaned with Sodium Hypochlorite solution 1%. Cleaning of the mortuary at every step should be taken care of.⁴

Sometimes the family members may be in isolation or quarantine and the body may have to be stored till the family members can join the funeral.²²

Autopsy

Evidence is poor regarding the transmission of this disease while handling the dead bodies or while doing the post-mortem examination on such dead bodies. In a study where dead bodies had a positive test for the CORONA-19, after conducting the autopsy no tests were positive on the face shields and no test was found positive after cleaning and disinfecting of autopsy table and floor. No association was observed of post-mortem interval and environmental contamination with this virus.²³

Autopsy in such cases falls in category 3 of hazardous organisms according to the Royal College of Pathologists²⁴ guidelines for the autopsy has been provided by the Red Cross² and Royal College of pathologists.²⁴ Some say that autopsy should be avoided in such cases if possible²⁵ but according to others, this infection should not be a bar to the collection of evidence during an autopsy and investigation of the death in a proper manner taking due precautions to avoid the spread of this disease.² Autopsy should be done in medicolegal cases.⁴ It should be done very carefully to avoid spreading infection amongst the workers in the mortuary and those conducting the

post-mortem examination.²⁶ When the autopsy is to be performed it should be done in well-ventilated rooms. Before starting the autopsy, it should be seen that all the health workers working in the mortuary are protected by using standard safety precautions including wearing Personal Protective Equipment [PPE] Kits. The autopsy should be carried out using a minimum number of persons who should wear a mask N95 or FFP3 or FFP2.¹ Scissors used should be round ended and blades should be blunt-ended so that prick injuries do not occur. Needles should not be re-sheathed.⁴ Smoking and eating in the mortuary should be avoided. Double surgical gloves and cut-proof mesh gloves should be used.²⁶ Shoe protection should also be used in mortuaries.² Sharps should be handled carefully and disposed of in the containers specially meant for sharps.²⁷

If standard precautions are taken during autopsy there may not be an increased risk of infection except if the lungs are handled. Preferably one body cavity should be opened at one time.⁴ All the procedures which create aerosols should be done with special care e.g., while using power saws or while washing the intestines.¹ Negative pressure should be maintained in the mortuaries.⁴

In suspicious cases during autopsy swabs from Upper Respiratory Tract [URT] and Lower Respiratory Tract [LRT] should be collected. For the URT from the nasopharynx and for the LRT from the lungs, samples should be collected for confirmation of the disease. Reverse Transcription-Polymerase chain Reaction [RT-PCR] test should be done. If other microbiological tests are needed in a particular autopsy, then separate swabs should be collected. Samples of pieces of heart, lungs, spleen and kidney in 10% formalin may be sent if details of pathological conditions of these organs are required.²¹

In suspected and confirmed cases of SARS-CoV-2 all bio-safety measures and infection control policy should be followed²¹. Persons who are collecting the specimen should follow the isolation precautions guidelines with proper training and surveillance.¹⁸

After the autopsied body should be disinfected with 1% sodium Hypochlorite solution and placed in a leak-proof body bag which should also be disinfected with 1% sodium Hypochlorite solution from outside. The autopsy table and instruments used should also be disinfected.⁴ Body bag can be wrapped in a mortuary sheet or sheet brought by the relatives.²⁷

The body can be given to the police who can hand it over to the relatives after explaining to them all the precautions and the local rules and instructions of the government should be followed. Relatives taking the dead body should be in a PPE kit.²⁵

Different strategies have been advised by different guidelines but so far, no evidence has been available for an effective strategy and

there are research gaps that need to be further evaluated.²⁸

Virtual autopsy in COVID-19 cases

A virtual autopsy can be of great help in dead bodies having SARS-CoV-2. The images can help in the diagnosis of the disease.²⁹ Virtopsy can be a measure to reduce the infection to the forensic pathologists as there will be less exposure in such cases.³⁰ In India a case suffering from COVID-19 disease of the virtual autopsy has been reported from Kota.³¹

Environmental cleaning

Fomites transfer of the virus is possible in this disease so the environment must be cleaned. All the instruments should be sterilized after use. All the surfaces where the body came into contact should be washed with detergent and then cleaned with 1% sodium hypochlorite solutions.¹ Beds, IV Stands, side tables, floors and railings should be disinfected with 1% sodium hypochlorite solutions.⁴

Mortuary waste should be handled as per the law of the state.¹

Disposal of the dead body from homes

If the body is at home, gloves, face masks and face shields should be used and clothes should be washed immediately after and other clothes should be worn. Children, people over 60 and immuno-compromised people should not come near the body and others should also keep a minimum one-meter distance from the body. The number of participants at the final rites should be limited by the authorities.¹

Repatriation of human remains

Repatriation is the process of sending human remains from one country to other at the request of the relatives or friends of the deceased. Usually, for repatriation identification, a death certificate and certificate of dead body free from infection are required and in addition to this, some countries may have their requirements like embalming of the dead body. Embalming is not done in many countries in the COVID-19 deaths. The best way is to cremate the dead body and take the ashes in the urn as this does not carry any infection due to SARS-CoV-2 but it may not be preferable in certain religions. In those countries where burial is to be done and cremation cannot be done then case to case should be discussed with the concerned governments.³²

Transportation

Body after the autopsy in a leak-proof body bag which has been disinfected from outside poses no extra danger to the persons transporting the body if they are using standard precautions. After the body has been given for cremation or burial vehicle should be disinfected.⁴

Religious rites

Religious preachers and persons doing the last rites should be

trained to take standard precautions.⁴ In persons who have died due to suspected or confirmed CORONA-19, disposal of their dead bodies can be done by burial according to their religious beliefs.¹ Face of the deceased can be shown to the relatives by unzipping the body bag.⁴

Cremation

Cremation is a preferred method of disposal of the dead body as it eliminates the chances of the spread of the disease. It can be done in an electric or gas crematorium or routine manner.²⁵ Cremation can be done according to the religious beliefs of the dead person. A religious ritual such as chanting of prayers and a sprinkling of water over the body with no touch to the body can be done. Ashes can also be collected and disposed of from the last rites⁶ and it does not pose additional risks.⁴ Number of participants at the cremation ground should be limited by the authorities.^{1,4} After the cremation hand hygiene is very important for the workers involved with cremation.⁴

Burial

Relatives and friends may see the body after it has been prepared for burial but no one should touch or kiss the body at this moment. Those who are going to lower the body in graves should wear gloves and masks and should wash their hands with soap after removing the gloves after finishing the job.¹ Burial should be done in airtight, thick coffins. Depth should be normal 4-6 feet deep. Preferably the area adjacent to the grave and over the grave should be cemented immediately.²⁵ After the burial is over hand hygiene is very important for the workers involved with burial.⁴ Number of participants at the cremation ground should be limited by the authorities.¹⁴

Other forms of final disposal

In addition to cremation and burial bodies are also disposed of by donating to the medical institutions for training and research purposes where students do the dissection. Medical institutions have stopped taking bodies with suspected and proved infection with this virus.³³ Bodies are also disposed of by sea and sky burial. It is also done by immurement, dissolution and composting. Sometimes bodies are mummified before disposal.³⁴ Standard precautions should also be taken in these forms of disposal. Such forms of disposal have not been studied properly in COVID-19 cases. Bodies are sometimes also disposed of criminally just by throwing in flowing water and forests and no one is going to take precautions in such cases and it will be hazardous to the population.

Water burial in the holy Ganges River is also a method for the final rites. Dead Bodies on a temporary platform are floated on the running water. Usually, this is done by the poor who cannot afford cremation and at some places, unwed girls are also given water burial.³⁵ For sea burial bodies are usually buried in the sea

beyond 3 nautical miles from the shore and no such material should be used for burying which will not decompose in marine water.³⁶ Body can be disposed of by composting. The body is put in the big jars lining an indoor park. When the body turns into compost relatives take a pot of soil and can be used in the foundation of a flower bed.³⁷ The body can be liquefied by a chemical process and thrown in sewers. This is a legal procedure in Ontario and duly licensed persons can do it there in Canada. Others are turning the body into Vinyl Records, morph into beautiful trees, animals may eat the dead body, or it may be turned into a coral reef, or put the body in a burlap bag. These methods may be less harmful to the environment.³⁸ Bodies are also kept in the Tower of Silence after removing the clothing.³⁹ Bodies are also kept at hilltops for sky burial. Natural scavengers e.g., vultures will eat the body.⁴⁰ Famadihana is another ritual where people dance around the graves, open the tombs and change their clothes to speed up the process of decomposition. Others turn ashes after cremation into beautiful beads and are kept in glasses or dishes at a central place in homes. Some hang the coffins on cliffs and others entomb the body vertically in trees after hollowing them.⁴¹

Though no studies have come to the notice for these different forms of the disposal of the dead bodies yet standard precautions should be taken while disposing of the dead bodies. Precautions should be taken that the virus does not spread.

Embalming of the dead body

There are challenges to the embalming in the dead bodies used in medical colleges during this COVID-19 pandemic.⁴² Routine embalming of the dead body is not recommended.⁴ Centre for Disease Control and Prevention [CDC] says that if standard precautions are taken body can be embalmed without any undue risks. The body should not be touched and PPE will be helpful.⁴²

For all those visiting mortuaries

At least wear a cloth covering the face. Wash hands with soap and water at least for 20 seconds or scrub the hands with a 70% alcohol-based hand rub. Touching the nose mouth and eyes should be avoided with unwashed hands. Maintain a social distance and follow respiratory etiquettes. Sick persons should not come and stay at home. Persons with reduced immunity and underlying conditions should avoid such places.⁴³

Workers in the mortuaries

Workers in the mortuaries may be at a high risk of contracting this illness. Workers should be screened for higher temperatures. If a higher temperature is found then measures should be taken for the arrangements for testing them. Sick workers should not be allowed to do their duties. There should be flexibility for sick leaves. Identify and isolate the cases. Criteria should be developed when the recovered workers can

join the duties.⁴³

The ventilation system should be adjusted to allow more fresh air. Distance between the employees should be increased if possible. Increase the frequency of cleaning and disinfection.⁴³

A virtual autopsy should be considered where ever possible.

Vaccination of all the workers should be the top priority. It is better that persons should be put on mortuary duty only after they are fully vaccinated. As there are chances of workers getting infected and spreading the disease there are on the priority list to get a vaccination.⁴⁴

Material & Methods

Google search and Google scholar search for the last 2 years were searched with the keywords of COVID-19 & Dead body management. Results of the search were evaluated after reading the titles of the results and the material from the most relevant search results to the topic was included in the paper.

Discussion

CORONA-19 was declared a pandemic by the WHO on March 11, 2019.²⁸ Though it is a well-ascertained fact that forensic pathologists are more prone to infection by this disease and virtual autopsy can reduce this danger. It will be good in those countries where it can be afforded but in developing countries, these facilities may be very limited but will be useful where ever MRI and CT Scanning facilities are available for post-mortem examination. Routine portable X-ray machines and ultrasound machines may be helpful in certain situations.³⁰ Persons over the age of 60 years and those who are immune-suppressed should not interact with the body suspected of having SARS-CoV-2 infection as they are considered more prone to the disease.¹ Some states have taken the responsibility for the final rites of the deceased to prevent the spread of the disease. Family members are allowed to be present in the final rites according to their religious preferences but they are not allowed to touch, kiss or bathe the dead body but the number of people present in the final rites has been limited. Most of the states in India are following the guidelines issued by the Department of Health and Family Welfare, Government of India.⁶ Dead body should be handed over to the relatives only if the test on the dead body is negative.⁷

Forensic pathologists have to play a very important role in such circumstances especially when a medicolegal autopsy is required. He is to coordinate with the different entities maybe it is the police or the relatives and friends of the deceased. He is to take care of the dead body while it is in his custody and then guide the others to mitigate the ill effects of the pandemic.

This needs planning right from the time person is dead due to this infection either in the hospital or home, proper storage of such dead bodies if required, their identification and disposal according to the religious beliefs of the people and providing adequate help and resources so that all this can be carried out in a dignified manner to avoid mental stress to the people at large and avoiding the spread of the disease by taking standard precautions and following the national and state guidelines from time to time.

Conclusion

Cases of SARS-CoV-2 are going to stay in the community and so will be dead bodies due to this disease. All forensic pathologists will have to deal with such dead bodies in the times to come. There is a big amount of misinformation and even rumours sometimes about the management of the dead body. There is a need that all those dealing with dead bodies should have evidence-based information to practice and fearlessly deal in such cases and that is possible only to be always updated on the latest scientific information concerned with the management of the dead bodies. If an autopsy is needed it can be carried out taking all the precautions. Last rites should be allowed according to the religious beliefs of the persons and both cremation and burial are allowed in the different guidelines. Precautions must be taken while doing the autopsy and last rites. Following these precautions will help in checking the spread of the diseases and giving them a dignified farewell from this world thus helping in maintaining the dignity of the dead body and preventing the spread of the disease.

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