

Review Article

Nurses indispensable role during COVID-19

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ABSTRACT

There is a new public health crisis threatening the world with the emergence and spread of 2019 novel coronavirus (2019-nCoV) or the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), as it is now called, is rapidly spreading from its origin in Wuhan City of Hubei Province of China to the rest of the world. Coronaviruses are enveloped positive-sense RNA viruses that are diversely found in humans and wildlife originated in bats ranging from 60 nm to 140 nm in diameter with spike-like projections on its surface giving it a crown-like appearance under the electron microscope, hence the name coronavirus. A total of six species have been identified which are known to infect the neurological, respiratory, enteric, and hepatic systems. The epicenter of infection was linked to seafood and exotic animal wholesale markets in the city. SARS-CoV-2 is highly contagious and has resulted in a rapid pandemic of COVID-19. As the number of cases continues to rise, it is clear that these viruses pose a threat to public health. The disease is transmitted by inhalation or contact with infected droplets and the incubation period ranges from 2 to 14 days. The symptoms are usually fever, cough, sore throat, breathlessness, fatigue, and malaise among others. The disease is mild in most people; in some (usually the elderly and those with comorbidities), it may progress to pneumonia, acute respiratory distress syndrome (ARDS), and multiorgan dysfunction. Many people are asymptomatic. The case fatality rate is estimated to range from 2 to 3%. Treatment is essentially supportive; role of antiviral agents is yet to be established. Prevention entails home isolation of suspected cases and those with mild illnesses and strict infection control measure at hospitals that include contact and droplet precautions. The global impact of this new epidemic is yet uncertain. We conducted a literature review of publicly available information to summarize knowledge about the pathogen and the current epidemic. In this literature review, the causative agent, epidemiology, pathogenesis, diagnosis, and nurses role regarding disease, control, and prevention strategies are all reviewed. It will also provide a means to raise awareness among primary and secondary health-care providers during the current pandemic.

Keywords: COVID-19, SARS-CoV-2, Novel coronavirus, Pandemic, Nurses role

INTRODUCTION

The 2019 novel coronavirus (2019-nCoV) or the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), as it is now called, is rapidly spreading from its origin in Wuhan City of Hubei Province of China to the rest of the world.^[1] Coronaviruses are enveloped positive-sense RNA viruses ranging from 60 nm to 140 nm in diameter with spike-like projections on its surface giving it a crown-like appearance under the electron microscope, hence the name coronavirus. Four coronaviruses, namely, HKU1, NL63, 229E, and OC43 have been in circulation in humans and generally cause mild respiratory disease.^[2]

ORIGIN

In December 2019, adults in Wuhan, capital city of Hubei Province and a major transportation hub of China started presenting to local hospitals with severe pneumonia of unknown cause. Many

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of the initial cases had a common exposure to the Huanan Wholesale Seafood Market that also traded live animals. The surveillance system (put into place after the SARS outbreak) was activated and respiratory samples of patients were sent to reference laboratories for etiologic investigations.^[2]

On December 31, 2019, China notified the outbreak to the World Health Organization, and on January 1, the Huanan Seafood Market was closed. On January 7, the virus was identified as a coronavirus that had >95% homology with the bat coronavirus and >70% similarity with the SARS-CoV. Environmental samples from the Huanan Seafood Market also tested positive, signifying that the virus originated from there. The first fatal case was reported on January 11, 2020.^[3]

By January 23, the 11 million population of Wuhan was placed under lockdown with restrictions of entry and exit from the region. Soon this lockdown was extended to other cities of Hubei Province.

It is important to note that while the number of new cases has reduced in China lately, they have increased exponentially in other countries including South Korea, Italy, and Iran.

EPIDEMIOLOGY AND PATHOGENESIS

Transmission

Infection is transmitted through large droplets generated during coughing and sneezing by symptomatic patients but can also occur from asymptomatic people and before onset of symptoms.^[4]

These infected droplets can spread 1–2 m and deposit on surfaces. The virus can remain viable on surfaces for days in favorable atmospheric conditions but are destroyed in less than a minute by common disinfectants such as sodium hypochlorite and hydrogen peroxide.^[5]

Infection is acquired either by inhalation of these droplets or touching surfaces contaminated by them or then touching the nose, mouth, and eyes. The virus is also present in the stool and contamination of the water supply and subsequent transmission through aerosolization/feco-oral route is also hypothesized.^[6]

INCUBATION PERIOD

The incubation period varies from 2 to 14 days (median 5 d). Studies have identified angiotensin receptor 2 (ACE₂) as the receptor through which the virus enters the respiratory mucosa.^[7]

SIGNS AND SYMPTOMS

The clinical features of COVID-19 are varied, ranging from asymptomatic state to acute respiratory distress syndrome (ARDS) and multiorgan dysfunction.

Common Clinical Features Include:

Upper respiratory tract infection includes fever (not in all), cough, sore throat, headache, fatigue, myalgia, and breathlessness.

Tachypnea, patients with severe disease present with severe pneumonia, ARDS, sepsis, or septic shock.

Conjunctivitis has also been described. Thus, they are indistinguishable from other respiratory infections. In a subset of patients, by the end of the 1st week, the disease can progress to pneumonia, respiratory failure, and death.

DIAGNOSIS

Specific diagnosis is by specific molecular tests on respiratory samples (throat swab/nasopharyngeal swab/sputum/endotracheal aspirates and bronchoalveolar lavage).^[8]

PREVENTION OF TRANSMISSION

SARS-CoV-2 spreads through respiratory droplets and physical contact. It is essential to practice precautionary measures to prevent transmission.

Standard precautions consist of:

Hand hygiene

Hand hygiene should be done with alcohol-based hand rubs (ABHRs) containing 60–80% ethanol. Handwashing following the correct steps with soap and water should suffice. Cloth towels should be avoided for drying hands and disposable tissue papers should be preferred.

Use of personal protective equipment (PPE): PPE consists of the medical masks or particulate respirators, face shields or goggles, gowns, gloves, and shoe covers.

Respiratory and cough etiquettes: Respiratory and cough etiquettes should be adhered to covering the nose and mouth while sneezing and coughing, using disposable tissue paper instead of cotton cloth, and if nothing else is available, using the flexed elbow, followed by appropriate hand hygiene.

Symptomatic patients in the community settings should be discouraged from congregating in public or crowded areas. Information, education, and communication (IEC) messages should encourage self-deferral and self-containment for patients who are symptomatic. For home care, patients should be placed in a well-ventilated room. In health-care settings, the patient should be placed in a negative-pressure room.^[9]

ROLE OF NURSE IN DIFFERENT PHASES OF MANAGEMENT

Isolation remains the most effective measure for containment of COVID-19. No specific antiviral medication or vaccine is

currently available. Therefore, the treatment of COVID-19 includes symptomatic care and oxygen therapy. This can be achieved with the use of acetaminophen, external cooling, oxygen therapy, nutritional supplements, and antibacterial therapy.^[10]

However, critically ill patients may require high-flow oxygen, extracorporeal membrane oxygenation (ECMO), glucocorticoid therapy, and convalescent plasma.

Patients with respiratory failure may require intubation, mechanical ventilation, high-flow nasal oxygen, or non-invasive ventilation.

Treatment of septic shock requires hemodynamic support with the administration of vasopressors.

Therapeutically, aerosol administration of alpha-interferon (5 million units twice daily), chloroquine phosphate, and lopinavir/ritonavir has been suggested. Other suggested antivirals include ribavirin and abidor.^[11]

As till now, there is no effective drug or a vaccine against this virus, management of this epidemic depends on effective prevention and control of disease transmission. These preventive actions include use transmission-based precautions (e.g., precautions for contact, droplet, and airborne) with the effective implementation and ensuring IPC measures in health-care facilities. These measures include:^[12,13]

1. Preparedness: In preparation, HCWs or health-care setting involved in the diagnostic testing, treatment and care for suspected, probable, or confirm COVID-19 patients should:
 - Review and understand the local and national protocols and confirm that standard operational procedures (SOPs) are explained clearly, and HCWs are informed with them; for example, how PPE should be used and where PPE is stored.
 - Review SOPs for promptly and effectively decontaminating areas of the facility where suspected or confirm cases have been placed.
 - Ensure that HCWs are familiar to that area where a case will be isolated and the requirement of an airborne infection isolation room (AIIR). It is a room at negative pressure with a minimum of 12 air change/hour and accommodate only single patient. Air before recirculation should be filtered through a high efficiency particulate air filter or directly exhausted to outside.
 - Ensure that HCWs involve in assessment or care for COVID-19 patients should be well aware with a filtering facepiece respirator.
 - Ensure that HCWs who are caring for COVID-19 case should be well trained in the proper donning and doffing with adequately disposal of PPE.
 - Ensure HCWs are aware to whom they should contact for discussion and information about a suspected and probable case within their health-care facility.
2. Appropriate and prompt triage system: Triage system includes prompt and correct assessment of all patients at the time of admission which facilitate early detection and control of transmission (isolating patients with suspected case of COVID-19).
 - Ensure that sufficient and appropriate supplies of filtering facepiece-3 (FFP3) respirators, gloves, full sleeved, disposable gown, eye protection (e.g., disposable goggles or face visor), biomedical waste bins, hand wash material, natural detergent, chlorine based solution for disinfection, etc., and all HCWs should be well trained regarding the proper use of these supplies or equipment needed while working with patients.
 - For the early detection of cases of suspected COVID-19, health-care setting should encourage HCWs to screen all patients visiting the hospital with clinical suspicion.
 - Set up an advanced and well-equipped station at the entrance of health-care setting.
 - Implement the use of screening questionnaires based on the updated case definition of COVID-19.
 - Paste visual alerts with specific instructions in appropriate language at specific places such as entrance, waiting areas, lifts, and canteen about preventive measures of SARS-CoV-2.
 - Encourage all persons including HCWs for hand hygiene, respiratory hygiene, cough etiquettes, and appropriate use of PPE.
3. Standard precautions for all patients: Standard precautions should be used believing that each individual is likely to have infection with an organism that could be spread in the health-care facility.
 - Instruct, encourage, and supervise all HCWs, patients, and their attendants to practice standard precautions which include:
 - Hand hygiene: Follow the WHO's "My 5 Moments for Hand Hygiene approach" (before touching a patient, before performing any procedure, after exposure to body secretion, after touching a patient, and after contacting the surrounding or items of a patient). Perform hand hygiene preferably with an ABHR or with soap and water if visibly soiled.
 - Respiratory hygiene and cough etiquettes: It will minimize the risk of cross-infection of respiratory disease and include the following measures:
 - All people should be encouraged to practice to use disposable tissue to cover their nose and mouth when sneezing and coughing.
 - Personal protective equipment (PPE): Instruct, reinforce, and supervise all persons and HCWs for correctly and consistently use of PPE (glove, gown, respirator, and eye protection).
 - Use N-95 respirators by all individual entering the patient's area. HCWs must be fit tested before applying

this respirator. If N-95 mask is not available, simple surgical face mask also may be used.

- Use of full-sleeved, fluid-resistant, and single-use gown.
 - Use disposable gloves when contact with the patient or surroundings.
 - Use eye protection when contact with patient.
 - Clinical waste must be discarded in leak-proof biomedical waste bin and disposed properly.
 - Used linen must be categorized as contaminated.
4. Specific measures for care of COVID-19 suspected and confirmed cases
1. Patient placement (Isolation):
 - A suspected or confirm case should be placed in an AIIR if available. A single with attached toilet and bathroom should be used when an AIIR is not available. Room doors should be kept closed.
 - In a critical care unit, the case should be managed in a single cubical with negative pressure if possible, or, in a neutral pressure room with the door closed when negative pressure is not available.
 - If room with attached toilet facility is not available, then an exclusive assigned commode should be used. It should be cleaned and decontaminated as per recommended protocol or schedule.
 - Appropriate arrangements should be done for the safe removal of the bedpan.
 2. Lobbies and donning and doffing PPE:
 - Lobbies also have the likelihood to get contamination and should be cleaned and disinfected regularly as per environmental disinfection policies.
 - It is strongly suggested that HCWs move from “dirty” to “clean” zones within the lobbies as they remove their PPE and perform hand hygiene after they exit from the room. Any extra items should not be store in lobby area.
 3. Information about infection risks:
 - Information about the requirement of isolation and infection prevention control measures which must be undertaken before entering the patient’s room. It is strongly advised that confidentiality of the patient must be maintained.
 4. Staff considerations:
 - All HCWs should be aware about emergency contact details involved in patient care so that if they get symptoms of COVID-19 can contact to health-care facility immediately.
 5. Visitors:
 - All visitors should be restricted to essential visitors only; such as parents of pediatric patients or an affected patient’s main carer.
 - It is suggested to screen all visitors for symptoms before entering the health-care setting.
 - Alternative ways for patient and visitor interactions (e.g., video call) should be utilized.
 - PPE must be made available to visitors, including instruction, demonstration, and supervision of correct usage and donning and doffing.
 6. Personal Protective Equipment:
 - All persons entering the patient room should wear PPE. Donning and doffing of PPE must be done
 - Before donning, health care workers should put on scrubs, ensure hair is tied back securely and off the neck and collar, remove jewellery or pins, ensure they are hydrated, and perform hand hygiene. During donning, each item must be adjusted as required to ensure it fits correctly and interfaces well with other PPE items.
 - It is advised that gloves, gown, and eye protection should be removed before leaving patient room and disposed them biomedical waste bin.
 - It is very much crucial to understand that order for donning (putting on) of PPE is less critical then the order for doffing (putting off) to minimize the risk of cross contamination.
 7. Hand hygiene:
 - This is very much effective step and perform it before and after contact to each patient, removal of PPE, contact with patient surrounding or items, and disinfection of the environment.
 - Perform hand wash with soap and water or use an alcohol hand rub when hands are visibly clean.
 - It is strongly advised to all HCWs that they must not wear rings (expect a plain smooth band), wrist watches, and jewellery.
 8. Aerosol-generating procedures:
 - Any procedure that generates aerosols, such as open suctioning, induced cough, bronchoscopy, intubation, extubation, and positive-pressure ventilation through a face mask, have a high risk of spread. When these procedures are medically needed, they should be carried out in an AIIR, if available or in a single room with the door closed.
 - Only the essential and well-trained HCWs should be present in procedure room, and all must wear PPE as per recommendation.
 - When an aerosol producing procedure is carried out in the patient’s room, then same room should be disinfected 20 min after the completion of procedure.
 - When a room is utilized for an aerosol producing procedure, room should be left for 20 min, then decontaminate before use it again.
 9. Use of equipment:
 - As far as possible reusable supplies, items and equipment should be avoided to minimize the risk of cross-contamination.

- As per hospital waste management policy, all single-use items or equipment must be disposed.
 - Reusable equipment or supplies; if used, it should be cleaned and disinfected as per the instructions of manufacturer before leave the room.
 - Use exclusively assigned supplies to the patient in the isolation room.
 - Use closed suction system for all cases.
10. Environmental cleaning and decontamination:
- It is suggested that that a well-trained domestic staff should perform cleaning and decontamination with use of the proper PPE.
 - After cleaning with natural detergent, it should be decontaminated by a chlorine-based disinfectant solution with a minimum strength of 1000 ppm chlorine availability or as per policy of health-care facility.
 - The patient room should be cleaned and decontaminated at least once a day.
 - Commonly used hand touch surfaces and lobbies should be cleaned at least twice in a day.
11. Waste management:
- Large amount of waste may be produced by frequent utilization of PPE; get and follow the guidelines from the hospital waste management team to manage this issue.
 - All wastes should be disposed as per accordance for infectious clinical waste.
 - All waste from a suspected or confirmed case strictly disposed as per Category B waste management.
12. Specimens:^[14]
- All samples and request forms should be marked with a biohazard label.
 - The samples should be double packed in the same room where sample has been collected by a HCW wearing PPE.
 - All samples should be handed over personally to the laboratory by a person who understands the nature of the samples.
 - Transport of specimens between laboratories should be as per Category B transportation recommendations.
13. Transfers of patient to other departments:
- Patients should be transferred to other departments only, in the presence of specific clinical needs and after detail discussion with infection control team. The transfer of patient to other department includes following procedures:
 - The bed or trolley that utilized to transfer the patient from the room of one department to other department should be decontaminated immediately before leaving the patient room by a HCW with protective cloths and PPE.
 - The department where the patient is going to be transferred must be informed in advance.
 - Any unnecessary equipment or item must be removed from the procedure or treatment room.
 - The procedure or treatment room, bed, trolley, or chair and other used equipment should be cleaned and disinfected immediately after use.
14. Caring dead bodies:
- A body bag should be used for transferring the body should be transferred in a body bag and HCWs who involved in handling the body must use PPE.
 - As per environmental disinfection protocols decontaminate the outer surface of the body bag and the trolley carrying the body immediately before body bag exit from the lobby. This process requires minimum two person wearing all PPE and protective cloths.
 - HCWs must remove their protective clothing before leaving the lobby.
 - HCWs should use all PPE when it is needed to open the body bag in the hospital mortuary.
 - It is acceptable to wash or prepare with wearing full PPE. Mortuary and funeral persons must be informed of the biohazard risk.
 - Empty body bags must be disposed of as per regulation of Category-B waste management.
 - Reporting within health-care setting and to local health authorities:^[15]
 - Implement policies that promptly inform local or state health authorities about suspected or confirm case of COVID-19.
 - It is suggested to designate team or person from the facility who are responsible for collecting and dissemination of information to public health authorities and HCWs within facility.

CONCLUSION

The COVID-19 pandemic is spreading across the globe at an alarming rate. It has caused more infections and deaths as compared with SARS or MERS. Elderly and immunocompromised patients are at the greatest risk of fatality. The rapid spread of disease warrants intense surveillance and isolation protocols to prevent further transmission. No confirmed medication or vaccine has been developed. Current treatment strategies are aimed at symptomatic care and oxygen therapy. Prophylactic vaccination is required for the future prevention of COV-related epidemic or pandemic. Health care workers play a pivotal role to prevent and manage the pandemic cases.

Declaration of patient consent

Patient's consent not required as patients identity is not disclosed or compromised.

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Conflicts of interest

There are no conflicts of interest.

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