

Preventive and Protective Measures Against Covid-19 Pandemic: An Evidence Based Review

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ABSTRACT

Background: The recent outbreak of coronavirus 2(SARS-CoV-2) and its associated disease has spread globally has kept the whole world on their toes emergency with a currently known overall mortality rate to be as high as 3.4%. Thus far, no vaccine has been formulated for the novel coronavirus. An extensive study of literature describing the pathogen characteristics, modes of transmission, symptoms of COVID-19 and appropriate preventive and protective measures to combat its outrageous spread which include protocols of hand hygiene, cleaning and disinfection, use of masks, guidelines on home quarantine, triage, usage of personal protective equipment. Since awareness is the key to eradicate apprehension, proper public health education is ought to help dispel myths about the disease and rise to the challenge of COVID-19.

Keywords: Coronavirus, COVID-19, Pandemic, Preventive Measures, Protective Measures, Personal Protective Equipment.

INTRODUCTION

The notorious outbreak of Coronavirus Disease 2019(COVID-19) in the mid- December 2019, Wuhan, China¹, has evolved swiftly into a global health crisis and has spread exponentially to other parts of the world. The World Health Organization (WHO) on January 30, 2020, declared the raging spread of SARS-CoV-2 and its associated disease (COVID-19) a public health emergency with a currently known overall mortality rate to be as high as 3.4%^{2,3}.

With the advent of COVID-19 pandemic, all the countries are maximizing their efforts to combat the virus. But the potential problem will continue to persist until a vaccine is developed. WHO has made it clear that there are currently no known effective

treatments for COVID-19 and does not recommend the use of antiviral drugs, antibiotics⁴. Given this state of affairs, an ounce of prevention is worth a pound of cure. Public health education must be based on scientific evidence to reduce the apprehension and distress caused by false information. One should properly acknowledge the terms prevention and protection to avoid mounting disruption to the global supply of personal protective equipment (PPE) – caused by rising demand, panic buying, hoarding and misuse. A precaution is an action that is intended to prevent something unpleasant happening, whereas, protection is an action undertaken to safeguard one from the hazardous situation. This article aims to emphasize preventive and protective measures to

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be comprehended by public and health care professionals.

PATHOGEN CHARACTERISTICS:

The novel coronavirus belongs to a family named *Coronaviridae*, a single-stranded RNA genome viruses⁵ known to be zoonotic or transmitted from animals to humans⁶. Coronaviruses are large, mostly spherical, sometimes pleomorphic, enveloped particles with bulbous surface projections⁷ of 125nm total diameter^{8, 9}. The diameter of the envelope is 85nm and spikes are about 20nm long^{8, 9}.

MODES OF TRANSMISSION:

COVID-19 spreads predominantly by droplets produced as a result of coughing or sneezing of an infected person. The possible explanation for the presence of SARS-CoV-2 in secretory saliva is SARS-CoV-2 binds to human angiotensin-converting enzyme 2 receptors, which are highly concentrated in salivary glands^{10, 11}. Droplet transmission can happen in two ways¹²:

- a. **Direct close contact:** The virus could potentially transfer from infected to healthy individuals within a distance of less than 1 metre (3 feet) especially if the infected person does not cover their face while coughing or sneezing¹³.
- b. **Indirect contact:** Respiratory droplets of SARS-CoV-2 are too heavy to be airborne and thus land on inanimate objects causing the spread of infection when an uninfected person comes in contact with these objects¹⁴ and subsequently touches his eyes, nose or mouth¹².

Although studies have shown the presence of SARS-CoV-2 in faeces of affected patients^{10, 11} there is no evidence of faecal-oral transmission¹⁵.

HOW LONG DOES CORONA SURVIVE ON INANIMATE OBJECTS..?

Duration of survival depends on various factors which include: ¹⁶

- The type of surface virus is on
- Its exposure to sunlight
- Differences in environmental factors such as temperature and humidity

- Exposure to cleaning products

The amount of infectious virus on any contaminated surface is likely to have decreased within 48 hours under most circumstances. Few studies^{17, 18} which were done under controlled conditions revealed the survival time as shown in Table1:

Table 1: Survival time of coronavirus on SARS-Co-V-2 on various objects.

SUBSTANCE	TIME
Plastic	3-4 Days
Stainless Steel	3-4 Days
Copper	4 Hrs
Paper	4 Days
Glass	4 Days
Cardboard	24 Hrs
Wood	2 Days

SYMPTOMS:

Fever and cough being the most common of all, the signs and symptoms of COVID-19 vary throughout the disease. Most experienced symptoms¹⁹ are presented in Table 2. Less obvious symptoms include nausea, diarrhoea, reduced sense of smell (hyposmia), abnormal taste sensation (dysgeusia)²⁰. Also, headache, confusion, hemoptysis, vomiting, rhinorrhoea have been reported but are less common (<10%)¹⁹.

Table 2: Symptoms of COVID-19.

SYMPTOM	RANGE
Fever	83-99%
Cough	59-82%
Loss of appetite	40-84%
Fatigue	44-70%
Shortness of breath	31-40%
Coughing up sputum	28-33%
Myalgia	11-35%

COMPLICATIONS:

COVID-19 may not only affect the lungs causing pneumonia but may progress rapidly to acute respiratory distress syndrome (ARDS) causing respiratory failure, septic shock, or multi-organ failure and death¹⁹. Neurological manifestations

include seizures, stroke, encephalitis, and Guillain-Barre syndrome²¹. Cardiovascular complications may include heart failure, irregular electrical activity, blood clots, and heart inflammation²². While about 80% of cases manifest as mild symptoms, approximately 20% progress to more severe illness, with 6% requiring mechanical ventilation¹⁶.

INCUBATION TIME:

The time from exposure to onset of symptoms is around five days but may range from two to fourteen days^{23, 24}. Although transmission may be possible before symptoms appear and in later stages of the disease, COVID-19 is most contagious during the first three days after the onset of symptoms²⁵. Several studies have documented SARS-CoV-2 infection in patients who never develop symptoms and in patients not yet symptomatic¹⁹. These asymptomatic and pre-symptomatic patients act as “carriers” and also serve as a reservoir for re-emergence of infection¹.

PREVENTIVE MEASURES:

With the potential threat of coronavirus, preventive and mitigation measures are the key to be safe from the scourge and combat its outraging spread.

➤ WHO Guidelines – Advice For Public¹³:

1. Regularly and thoroughly clean your hands with an alcohol-based hand rub or wash them with soap and water for at least 20 seconds.
2. Maintain a minimum of 1 metre (3 feet) distance between yourself and others.
3. Avoid going to over-crowded places.
4. Avoid touching eyes, nose and mouth to avoid indirect transmission of the virus.
5. Follow good respiratory etiquette.
6. Stay home and self-isolate even with minor symptoms like cough, headache, mild fever, until recovery.

7. If you have a fever, cough and difficulty breathing, seek medical attention, but call by telephone beforehand and follow the directions of your local health authority.

- A. **HAND HYGIENE²⁶:** Proper handwashing and hand rub protocols recommended by World Health Organization are depicted in figure 1 and figure 2.



Fig 1: How to hand wash.



Fig 2: How to hand rub

- B. **RESPIRATORY HYGIENE – COUGH ETIQUETTE²⁷:**

All individuals with signs and symptoms of respiratory infection are recommended to follow certain measures to contain respiratory secretions.

- Use a tissue to cover your mouth and nose when coughing or sneezing
- If tissue is unavailable, cough or sneeze into your flexed elbow, not your hands.
- Use in the nearest waste repository to dispose of the tissue after use.
- Perform hand hygiene following contact with respiratory secretions and contaminated objects/materials.

C. SOCIAL DISTANCING²⁸:

COVID-19 spreads predominantly among people who are in close contact. When an infected person coughs, sneezes, or talks, and droplets from their mouth or nose, the droplets can be inhaled into the lungs. Centres for disease control and prevention (CDC) recommends social distancing or “physical distancing,” which means keeping space between yourself and other people outside of your home.

- Stay at least 6 feet (about 2 arms’ length) from other individuals.
- Keep out of crowded places and avoid mass gatherings.

D. USE OF MASKS BY GENERAL PUBLIC:

Persons having no symptoms are not to use a mask because it creates a false sense of security that can lead to overlooking other essential measures such as washing of hands²⁹. WHO stresses that medical masks and respirators should be prioritized for health care workers³⁰.

➤ **Applications of medical masks** (apart from health care worker)²⁹.

- When a person develops cough or fever, use of medical three-layer masks will prevent infection from spreading to others. However proper hand hygiene measures have to be practised.
- While paying a visit to a healthcare facility.
- While caring for an ill person.
- Close family contacts of suspect/confirmed cases undergoing home care should also use Triple-layer medical mask

- European Centre for Disease Prevention and Control (ECDC)³¹ suggests the use of face masks especially when visiting busy closed spaces but only as a complementary measure.
- CDC recommends³² use of cloth face coverings in public locations especially in areas of substantial community-based transmission where other social distancing measures are difficult to maintain.

➤ **Duration²⁹** for which a medical mask will remain effective is about 8 hours, however, it needs to be replaced if it gets wet.

➤ **Correct procedure of wearing triple-layer mask²⁹**

- Unfold the pleats and make sure that they are facing down.
- Place over nose, mouth and chin.
- Fit flexible nose piece over Nose Bridge.
- Secure with tie strings (upper string has to be tied on top of the head above the ears and lower string at the back of the neck.)
- Adjust to fit and ensure there are no gaps on either side of the mask.
- Avoid touching the mask while in use
- Do not let the mask hanging from the neck when not in use.
- Change the mask every six to eight hours or as soon as they become wet.
- Disposable masks are never to be reused.
- Great care must be taken while removing the mask not to touch the potentially contaminated outer surface of the mask.
- To remove mask untie the string below initially and then the string above and handle the mask using the upper strings.

E. QUARANTINE AND ISOLATION³³:

Isolation and quarantine aid in protecting the public by preventing exposure to people who have or may have a contagious disease.

- **Isolation** separates sick people with a contagious disease from healthy individuals.
- **Quarantine** separates and restricts the movement of people who were reasonably believed to have been exposed to a contagious

disease but no yet symptomatic to prevent the possible spread of disease.

➤ ***GUIDELINES FOR HOME QUARANTINE³⁴:***

The Guidelines for Quarantine in non-health care settings are as follows:

1. Allocate a separate room with adequate ventilation and improved airflow³⁵ at home. Household members should stay in another room or should be separated from the quarantined individual.
2. Maintain at least one-meter distance from the other family members.
3. Other family members should use a separate bathroom. If sharing the same bathroom, cleaning of taps, doorknobs and utensils with soap and water or Environmental protection agency (EPA) – registered disinfectant solution is recommended³⁶.
4. Minimize visitors to the house, the quarantined individual should not interact with any visitors.
5. Perform frequent hand washing with soap and water and maintain alcohol-based hand hygiene when hands are not visibly soiled.
6. Avoid touching eyes, nose and mouth.
7. The quarantined person is expected to monitor body temperature twice a day using a thermometer. If he/she develops fever, cough, difficulty in breathing, sore throat, body aches and pain, including flu-like symptoms, immediately inform public health inspectors of the zone.
8. Avoid contamination of surfaces with saliva, phlegm or respiratory secretions³⁵. After use, facemasks and gloves should be properly discarded without reuse, preferably in a closed receptacle.
9. Allocate separate dishes, drinking glasses, cups, eating utensils, towels, bedding, and other items for the quarantined person
10. Utensils, bed linen and clothes used by the person should be washed with soap and hot water.

➤ ***CLEANING AND DISINFECTING YOUR HOME³⁶:***

- Use of disposable gloves is recommended to clean, disinfect and while doing dirty laundry of a sick person.
- Clean frequently touched surfaces and soft surfaces using soap and water and later disinfect with an Environmental protection agency (EPA) – registered disinfectant solution.
- Diluted household bleach solutions of 70% alcohol solutions can also be used if appropriate.
- To make a bleach solution which will be effective for disinfection for 24 hours, mix 5 tablespoons (1/3rd cup) of bleach per gallon of water or 4 teaspoons of bleach per quart of water
- Dirty laundry should be handled gently and use warmest temperature settings.

RECOMMENDED PROTECTIVE MEASURES FOR HEALTH CARE PROFESSIONALS:

In the wake of COVID-19 pandemic, health care professionals are the superheroes saving millions of lives at the stake of their own. Proper protective measures are the need of the hour to avoid transmission from an infected patient which are to be employed right the moment the patient enters the health care setting appropriately.

➤ ***TRAINING¹⁶:***

Training of staff is a fundamental element and should be planned appropriately and targeted towards health-care staff. Such activities should comprise:

- Basic knowledge on the pathogen, transmission route, signs and clinical disease progression
- Hand hygiene protocol and respiratory hygiene
- Rational use of, and requirements for, PPE
- Environmental prevention procedures, including cleaning and disinfection.

➤ ***TRIAGE³⁷:***

By definition, triage is the sorting out and classification of patients or casualties to determine the priority of need and proper place

of treatment³⁸. During global pandemics, triage is particularly important to separate patients likely to be infected with the pathogen of concern. This triage protocol mentioned in figure 3 and figure 4 is developed in the context of limited and widespread community transmission of the COVID-19 pandemic

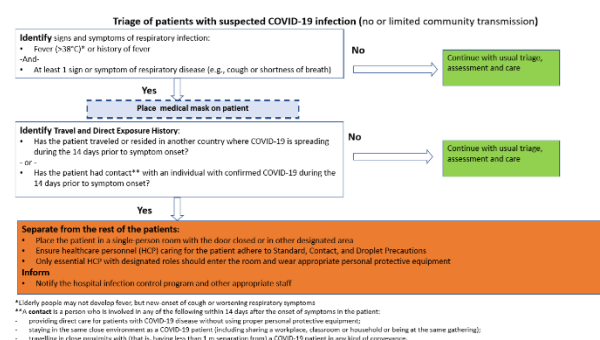


Fig 3: Triage of patients with COVID 19.

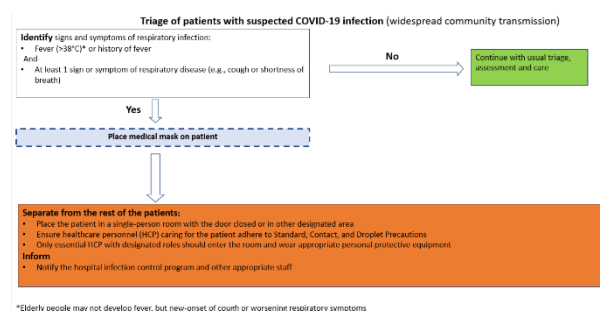


Fig 4: Triage of patients with COVID 19 with community transmission.

- All health care professionals are bound to practice standard precautions and isolation precautions appropriately³⁷.
 - Standard Precautions³⁹** can be defined as the minimum infection prevention practices that apply to all patient care, irrespective of suspected or confirmed infection status of the patient which include hand hygiene, use of PPE, safe injection practices, respiratory hygiene, cleaning and disinfection
 - Isolation Precautions⁴⁰** include contact, droplet precautions related to SARS-CoV-2 which prevent the spread of disease from infected to the other.
- Health care workers (HCWs) involved in physical examination of patients with

respiratory symptoms should wear **gowns, gloves, medical mask and eye protection³⁷**.

- Health care workers in the **triage** area who are conducting primary screening do not require PPE if they DO NOT have direct contact with the patient and MAINTAIN distance of at least one meter³⁷.
- Cleaners** in triage, waiting and examination areas ought to wear a gown, **heavy-duty gloves**, medical mask, eye protection³⁷.
- HCWs who develop respiratory symptoms (e.g., cough, shortness of breath) should stay home and follow necessary precautions³⁷.
- Triage area and the “respiratory waiting areas,” should be cleaned at least twice daily with an emphasis on frequently touched surfaces. 0.5% (5000ppm) chlorine or 70% alcohol for surfaces that do not tolerate chlorine is recommended for disinfection⁴¹.

➤ **HAND HYGIENE²⁶:**

Five moments at which hand hygiene should be performed by health care professionals are shown in figure 5.

Your 5 Moments for Hand Hygiene



Fig 5: Five moments for hand hygiene.

➤ **MASKS⁴²:**

- A **medical face mask** or surgical or procedure mask is a barrier to prevent **large respiratory droplets** and splashes covering the mouth,

nose and chin which should be used by **healthcare workers**.

- **Non-medical face masks** or community masks made of cloth are not standardised and are not intended for use in healthcare settings.
- **A respirator or filtering face piece (FFP)**, classified as personal protective equipment, is designed to protect the wearer from exposure to airborne contaminants which is recommended to use by healthcare workers, especially during aerosol-generating procedures.
- An **N95 respirator** is a respiratory protective device which achieves effective filtration of airborne elements recommended to use during aerosol-generating procedures. The 'N95' description depicts the ability of respirator to block at least 95 percent of very small (0.3 microns) test particles when subjected to cautious testing⁴³.

➤ **PERSONAL PROTECTIVE EQUIPMENT:**

Personal Protective Equipment's (PPEs) by definition are protective gears designed to safeguard the health care workers by curtailing the contact to a hazardous or infective biological agent which include goggles, face-shield, mask, gloves, coverall/gowns, head cover and shoe cover⁴⁴.

- Use Personal Protective Equipment (PPE) When Caring for Patients with Confirmed or Suspected COVID-19⁴⁵.
- PPE must be donned properly before entering the patient area (e.g., isolation room)⁴⁵.
- PPE must remain in place and be worn correctly all through the work in potentially contaminated areas⁴⁵.
- PPE should not be adjusted (e.g., retying gown, adjusting respirator/facemask) or touched frequently during patient care⁴⁵.
- PPE must be removed slowly and consciously in a sequence that prevents self-contamination. A step-by-step process of donning and doffing should be developed and used during training and patient care which are presented in figure 6, figure 7, and figure 8⁴⁵.



Fig 6: Sequence of wearing PPE.

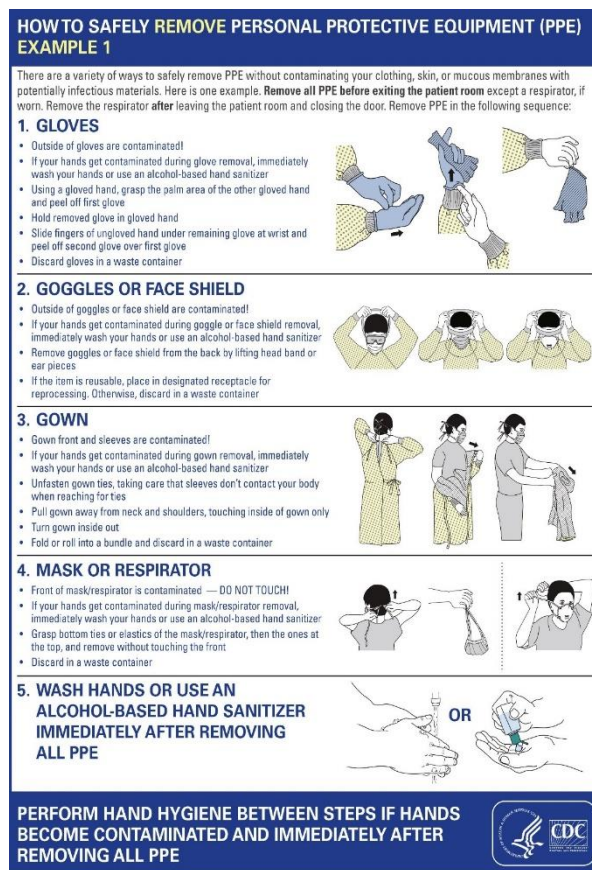


Fig 7: Steps of safely removal of PE.

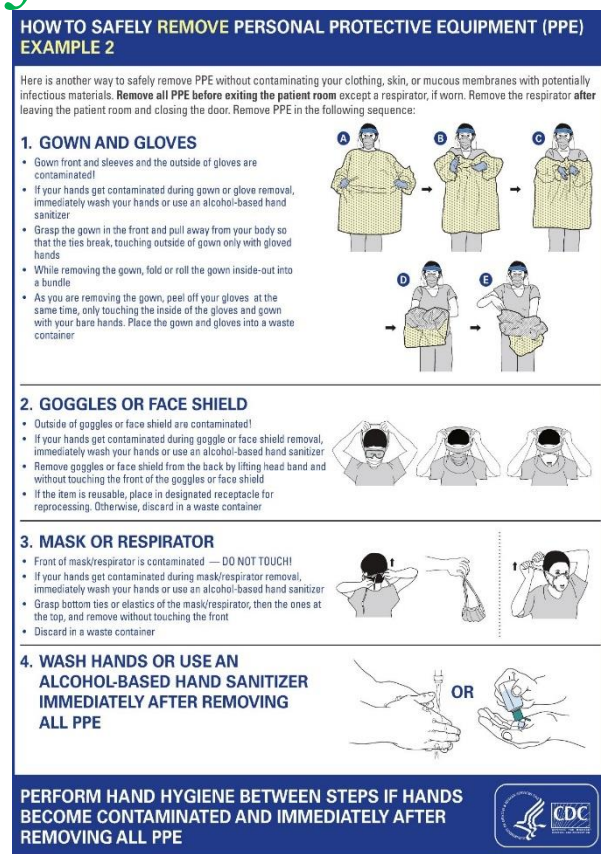


Fig 8: Steps of safely removal of PE, Example 2.

CONCLUSION

Since awareness is the key to eradicate apprehension, proper public health education is ought to help dispel myths about the disease and rise to the challenge of COVID-19.

CONFLICTS OF INTEREST

The authors declare they have no potential conflict of interests regarding this article.

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