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Covid-19 and PPE

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ABSTRACT

The new entry in the coronavirus family of SARS-COV2 has caused rapid spreading disease of COVID-19. It is among the most rapidly spreading diseases on earth as named coronavirus disease 2019 by world health organization (WHO) was originated in Wuhan city of Hubei province of China. Then from then, it grappled the entire world and left no stone unturned in creating panic. The morphology of the virus as it is seen by researchers compelled them to name it as coronavirus as its shape resembles the crown. It is a rapidly evolving disease with almost 38 million people infected till mid-October and around 1 million dead due to virus complications. Initially, there was lesser known about the virus hence to contain the virus, various measures were employed, including non-pharmacological interventions like lockdowns, physical distancing and so on. Only the essential services were run by the professionals. In order to safeguard them against the virus, various measures were taken. PPE or personal protective equipment which were given to all those working to contain COVID-19. It is important to wear a PPE as it reduces the chance of contracting the virus drastically. It provided standard operating procedures has been followed. Utmost care should be given in order to maximize the benefit of PPE. Here in this article, we are going to give some overview of PPE.



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INTRODUCTION

The worldwide crumbling of the health care sector infrastructure is quite concerning. It all started

after first reporting of coronavirus infection in China and spread all over the world. Previous outbreaks of the virus of these families like SARS and MERS were confined to particular geographical locations, hence named such. But this new variation of virus train with crown shape hence coronavirus is going wild. Almost the whole world's health care infrastructure has been collapsed due to rapid and exponential rise in cases. In earlier days after outbreak turned pandemic after World Health Organization notified it as a pandemic, health agencies and civil authorities were trying out various measures to contain the spread. Non-pharmacological measures like lockdowns and physical distancing were employed in order to keep people away from virus infection. The spread of coronavirus has made the general

public follow different measures such as social distancing and maintaining extreme hygiene. Different nations are maintaining lockdown so that the public does not come in contact with each other and can maintain physical distancing. Also, different nations have issued guidelines about how to maintain proper hygiene such as washing hands frequently, washing food items and other items when brought from outside, and others. Apart from these, there are also many guidelines offered, such as the usage of masks and gloves while traveling or coming in contact with someone else.

But what about the people who are involved with the patients of coronavirus, treating them so that they can get back to health soon? For such professionals, just having the general gloves and masks will not help. They need a special PPE kit in order to stay safe and also in order to cut out the spread of the virus to someone else.

Modes of Transmission

COVID-19 is a transmissible disease; it has been found out that SARS-CoV-2 is human-to-human transferrable. It is clear evidence that it is transmitted through the respiratory aerosol or droplets which get generated when people sneeze, cough or exhale. SARS-CoV-2 also spreads through coming in contact with the infected person when that person sneeze or cough than the infected droplets enter into the body of a normal person through nose, eyes or ears and then that person gets infected. COVID-19 also gets transmitted by direct touch or touching and by touching the contaminated objects or surface and then touching their own face (mouth, nose, eyes) (Ministry of Health and Family Welfare, 2020a). People who are in close contact with the suspected case or confirmed COVID-19 cases or who take care of such patients are at more risk of getting infected by COVID-19 (Figure 1).

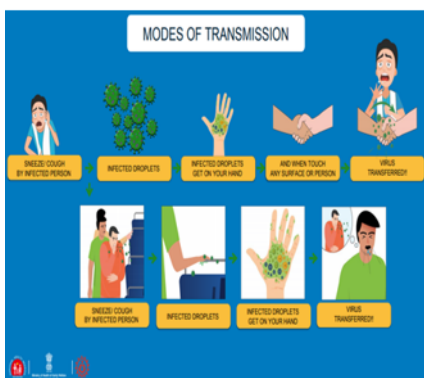


Figure 1: Modes of Transmission

Personal Protective Equipment (PPE)

PPE are the protective equipment designed in such

a way so as to protect and safeguard the health of workers by reducing the exposure to the atmospheric agent or virus-like coronavirus. It is the precautionary step so as to protect yourself and the people around you. PPE helps in preventing in getting in contact with infectious material, thus by creating a barrier between the potentially infected material and the health worker. PPE is basically equipment or cloth which is being worn in order to protect from getting infected by dangerous or infected agents.

Purpose of PPE

Health practitioners must wear PPE so as to stop the spread of infection or illness, protect their health from getting in contact with COVID-19, protect their patient's health, protect themselves by coming in touch with the virus and thus protecting the families and community health (Ministry of Health and Family Welfare, 2020b).

Components of PPE

There are a number of PPE kits that are available that the professionals can use depending upon the requirements. Some of the important items of the kit are Face shields, Glasses and goggles, Gloves, Head-covers, Masks, Masks with respirators, Shoe covers, Full gown (Figure 2).



Figure 2: Person wearing PPE Kit

Goggles and Face Shields

In the case of droplets generated by a sneeze, cough or an infected person can affect the contamination of mucous membranes of eyes, mouth and nose. Also, when the health workers operate the infected people the inadvertently touching the eyes, mouth, nose with the contaminated hand can spread the virus. So as to protect the mouth, nose, ears and face parts using goggles and face shield is a must. Goggles should be fixable to face, which will cover eyes and other areas and face shield will protect the entire face from getting in contact with the infected person droplets (Figure 3).



Figure 3: Goggles and Face Shield

Masks

While dealing with a suspect or confirmed case of COVID-19, the droplet/aerosol precautions are must by using the masks. Most of the virus-like coronavirus target the upper and lower respiratory tracts and thus protecting the droplets to enter in mouth and nose can be done by using masks. There are basically two types of mask, depending on the work environment.

Triple-layer medical mask

Disposable mask, fluid-resistant, provide protection to the wearer from droplets of infectious material emitted during coughing/sneezing/talking (Figure 4).



Figure 4: Triple Layer Mask

N-95 Respirator mask

These masks are much tighter air seal than triple-layer medical masks, and they are designed to protect the wearer from inhaling airborne particles. To provide the requisite air seal to the wearer, such masks are designed to achieve a very close facial fit (Figure 5).



Figure 5: N-95 Mask

Gloves

When a health worker is operating a suspected or confirmed covid-19 patients, it is possible that the

droplets can be entered through the touch of hands in contaminated objects or body parts. Thus, to protect from getting in touch with the virus, a nitrile non-powdered gloves are preferred to be worn. Nitrile gloves help in resisting chemicals and disinfectants such as chlorine (Figure 6).



Figure 6: Gloves

Gowns/Coveralls

Gowns/ coverall helps in protecting the whole body from getting exposed to the virus. Coveralls provide the whole body protection from virus covering back and lower legs as well as head and feet sometimes. By using proper clothing, it can act as a barrier between and help to reduce or eliminate the COVID-19 virus from spreading. Coveralls/gowns have stringent standards and thus help in protection from solid particle and chemicals (Figure 7).



Figure 7: Gowns

Shoe Covers

It is used for personal protection and decontamination as it will cover the shoes and legs from getting exposed to the virus. Shoe Covers must be made of impermeable fabric (Figure 8).



Figure 8: Shoe Covers

Headcovers

Headcover is used to cover the head and neck while providing treatment to patients. Hairs should get fitted in the Hair cover. While using a gown, we should use the headcover to cover the head (Figure 9).

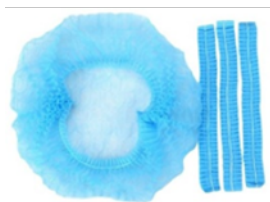


Figure 9: Head Cover

Process of Donning and Doffing

The coronavirus can spread out to people by touch and also by droplets. Hence, professionals who are involved in the treatment of the patients need to have a proper PPE kit so that there is not a single option left to get transmitted with the virus while offering treatment to the patients.

Not just the healthcare professionals, the kit is also required for people who are indulged in other practices such as dealing with the dead bodies of the people who have died of coronavirus, and others.

Protocols of using PPE Kit

There should be strict adherence to the protocols (Centre for Disease and Control Prevention, 2020) laid down by competent agencies in all parts of the world. PPE kit is not an option and is mandatory for patients as well as personals coming in direct contact with infected patients. However, the equipment's and components of the PPE kit may vary as patients needed to be treated and therefore cannot be covered from head to toe. But proper PPE should be provided so that it can be treated safely. But health care professionals need to wear PPE gears from head to toe as they are at higher risk of contracting virus. Various types of PPE kits are available among which most suitable should be chosen according to disease. As COVID-19 is highly infectious, it needs a lot of protection equipment to cover oneself from infection.

PPE cannot be used intermittently and should be used from starting of the duty till the end of the duty. Wearing and removing guidelines (Ministry of Health and Family Welfare, 2020b) are extremely necessary to be followed as these are the intermediate and most vulnerable stages. If you wear your PPE kit wrong, then there will be a false sense of security and chances of getting contracted by infection is higher. Also, size does matter in PPE kit as there are different physiological types of health

workers. Selecting and wearing correct size PPE kit can decide the safety from the virus. It is quite difficult to wear and check oneself whether they have worn it correctly, authorities can group two individuals to check on others whether they have worn it correctly or not. Best practices available in the world should be followed after analyzing it in the local context. If there is a shortage of PPE kit and authorities are planning to reuse the kits, then strict guidelines and proper sterilization method should be used in order to overcome the PPE shortage problems.

Although there are some challenges in PPE kits such as proper size and optimization, custom made PPE kits according to the health personals should be on top priority as one size fits all solution will only increase the vulnerability. Optimization of PPE kits so that it gives minimum restrictions and maximum possible comfort to the person wearing it so that the person's long working hours are bearable and efficient (Figure 10).



Figure 10: Process of Donning and Doffing

Benefits of using PPE kit

The usage of the PPE kit is very well understood during the spread of the virus Ebola. Due to the same reasons, the kit is being used now in many countries to deal with coronavirus patients. Here are some of the very basic reasons due to which making use of the PPE Kit is extremely important during this pandemic situation.

Health professionals such as doctors and nurses are in direct contact with the patients of coronavirus and hence they are at maximum risk. The use of general masks and gloves used by the general public is not enough in this case and hence making use of the PPE kit is the ultimate thing to be used.

If the doctors and other health experts will get contaminated with the virus, it will become really hard for a country to deal with the increasing number of patients getting infected by a coronavirus. Hence, it

is very important to keep these health professionals safe and secure so that they can deal with infected patients and can comfort them.

Just treating the patients infected by coronavirus is not the only thing. There are also a number of people involved in the process such as the ambulance professionals who bring in the patients till the hospital or even the people who deal with dead bodies of the people who have died. If proper precautions are not provided, many of these people do not take care of their responsibilities with 100% commitment due to the fear of getting infected.

PPE In India

In India, there were only 2.75 lakhs PPE kits in January which were imported one ([Ministry of Health and Family Welfare, 2020a](#)). There was not a single PPE kit manufactured in India as quoted by PM Modi. As of today, there are around 15.96 lakh PPE kits manufactured and stocked India. They were making India the second-largest producer of PPE kits after China ([Mandal, 2020](#)).

Earlier there was no production of PPE kits, and all the kits were manufactured. In a span of around two months since the outbreak of coronavirus India has produced around 2 lakhs PPE kits every day. ([Ministry of Health and Family Welfare, 2020a](#)) On average, around 1.5 lakhs PPE are produced daily in India. As of now, around 110 domestic PPE manufacturers in the country are identified by the government. This includes JCT Phagwara, Gokaldas Exports, Aditya Birla, Alok Industries etc ([Pandit, 2020](#)).

There is evident proof that PPE helps in reducing the rate of transmission and spread of the disease and protects health staff. It is very important that the health workers understand the purpose and use of PPE and its role in reducing the spread of the disease from patients to health works and other patients. It is of utmost importance that the workers use it in a proper way as the stock is limited and also ensure that there is sufficient supply during this epidemic surge.

CONCLUSION

PPE kits are no new thing to health care professionals. But changing situation needs adaptations and optimization. During previous contagious outbreaks like Ebola and MERS, it is very well highlighted the benefit of PPE kits. Also, it enables the health professionals to proceed for contact tracing as is required in a rapidly spreading disease like COVID-19. The idea of coupling two professionals so that they can monitor each other whether they

have worn the PPE kit according to the protocol or not, is immensely beneficial. Further shortage of the PPE kit should be resolved with innovative solutions and optimization. Proper disposal of PPE kits is also important of PPE kit cycle as the surface of PPE kits can harbour viruses for some time. All the best practices and protocols should be followed strictly. Hence, it is important to provide PPE kits to all the important people who are involved in the process of dealing with the coronavirus patients or have the maximum chances of coming in contact with the infected people.

Conflict of Interest

The authors declare that they have no conflict of interest for this study.

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