STUDY OF IMPORTANCE, USAGE AND DISPOSAL OF PPE KITS DURING THE PANDEMIC

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ABSTRACT: The Personal Protective Equipment, better known as PPE kit has gained a lot of attention among the general population, especially during the COVID-19 pandemic. What was initially only used by active practitioners and specialists is now known to all the people. The problem however comes with the population's varying levels of understanding regarding its usage, role and safe disposal. Partial knowledge of such aspects leads to unsatisfactory results and even complete ineffectiveness. The current research outlines the basic aspects of a PPE, its optimum usage and even comments upon means of safe disposal of used PPE. It also undertakes a short e-survey for general population regarding their knowledge and opinion of PPE.

The survey found that most of the people have a generalised positive opinion regarding efficacy of PPE. On the other hand, little awareness was found with respect to reusing or proper disposal of used kits.

Keywords: PPE, pandemic, disposal, e-survey

INTRODUCTION

The novel Corona virus (COVID 19) is a communicable disease caused by the SARS-CoV-2 virus. Common symptom includes delicate to moderate respiratory ailments like fever, cough, headache, fatigue, respiration difficulties, loss of smell etc. These symptoms typically begin one to fourteen days once exposure to virus. Also, one third of individuals did not develop noticeable symptoms. To many, complete recovery occurred without requiring any additional treatments and by just following social distancing protocol. Some individuals i.e. people with pre-existing medical conditions like diabetes, cancer etc. or even senior citizens were found to be at a higher risk of contracting severe symptoms and conditions, such as respiratory failure, organ failure or even death. Such patients often suffer from other long-lasting ailments like fatigue, bone density etc. even after recovery. Transmission takes place via inhalation or any contact with tiny droplets containing virus particles. The danger of respiration of such particles is highest when shut in proximity with infected individual. (Aslam *et al.,* 2021)

Several testing strategies are developed for diagnosis. The quality of the technique is determined by the detection of the viral supermolecules, commonly using Real-time Reverse Transcription Polymerase Chain Reaction (rRT-PCR), Transcription Mediated

Amplification (TMA), or by Reverse Transcription Loop-mediated equal amplification (RT-LAMP) from a bodily cavity swab. Many vaccines are approved and distributed in numerous countries that have initiated mass vaccination campaigns. Simple preventive measures like social distancing, quarantining of infected, ventilation of indoor spaces, covering while coughing or sneezing, frequent hand sanitization and avoiding frequent contact of (unclean) hands with eyes, face or other communal spaces, etc. are counselled in public settings to hamper transmission rates. Current work includes medicines that inhibit the virus. Management involves the treatment of symptoms, subsidiary care, isolation & experimental measures. (Aslam *et al.,* 2021)

The Personal Protective Equipment (PPE) is a clothing suit, when worn (correctly) isolates the wearer with greater extent from the environment, thus, ensuring full protection from several hazards and infectious diseases. They are designed to create a barrier against external solid, liquid or even airborne gaseous particles. PPE is divided into types based on their function and part of body they protect. It can be bought online depending upon the need and nature of work. It is an effective preventive measure against many infectious ailments, including COVID-19 and thus, becomes an essential requirement for healthcare and frontline workers, especially during the pandemic phase.

Following are the typical components of a PPE kit-

SAFETY EYEGLASSES

They protect the wearer from flying objects, dusts or mist, chemical splashes, excessive light intensity or harmful UV light. They also protect the area surrounding the eyes. While goggles are used by welders, eyeglasses are mostly used in chemical laboratories, fine woodworking and for sports manner it is used in (eg. swimming). A face shield also provides protection from airborne hazards and pathogens, covering the entire region from the forehead to the chin. It is recommended to use a face mask along with shield to ensure complete facial protection.

MASKS

It protects from contaminated air by covering the nose and the mouth regions, ensuring health of the respiratory tract. Although simple to use, masks have shown remarkable efficiency in lowering risks by air-borne pathogens, provided that it should be worn correctly. Thus, the user should ensure that there are neither or very little leakage while wearing mask.

Surgical mask: It is also called medical face mask, procedure mask or dental, isolation procedure mask. It provides protection by filtering air-borne pathogens. Compared to N95, it fits loosely and has limited to nil reusability.

N95 mask: It is also called Surgical N95, medical respirators, or healthcare respirators. Since it has a mechanical filter respirator, it is effective in blocking out particulate matter. It is however not recommended in oxygen deficient environments (high altitudes, firefighting).

GLOVES

It helps protect the hands, namely fingers, palm region (and forehand in some cases) from chemicals, contaminants, scratches, cuts and scrapes. Based on the requirement and work to be done, there are three basic glove technologies (viz. seamless knit, polymer, cut and sewn) and many types of gloves, namely surgical, electrical insulating, leather, cut-resistant, chemical resistant, heat resistant etc.

DISPOSABLE COVERALLS

They cover the whole body from chemical splash, dirt, dust, harmful substance etc. It should be used in an environment where there are greater chances of being in contact with chemicals or infectious agents such as hospital wards, laboratories working on biohazardous substances. They provide complete body protection, although they should be safely sterilised and disposed off after every use to prevent cross contamination. Coveralls usually have hair covers attached to it. Using hair covers protect exposure to hairs and even back of neck.

SHOE COVERS

It protects the feet from contaminants on the floor. It is to be made of impervious fabric, which provides protection and comfort as well.

Additionally, a PPE must also have following requirements – liquid-tight at arms, long sleeves, closed at the front, tight seal at cuffs, smooth surface.

They provide optimum protection only when used correctly. As a result, it is essential for the user to know about the working and using of PPE kit. Following points are to be emphasized while using a PPE kit.

1. They are not alternative preventive public health measure

2. A minimum of one meter physical distance should be maintained between the suspect and the user wearing PPE
3. Following the use, one must follow the protocol of disposing PPE as detailed in control guidelines available on the product, or as given by official manufacturer or guideline websites. (Singh *et al.,* 2021)

The current demand of PPE has conjointly affected different enterprises depending upon it, including structure, installation, oil and gas energy, shipping, firefighting, and food outcome. As a result, there has been unprecedented acceleration within the use of PPE. Because the predominance of COVID-19, medical waste production, like robes, scrutiny kits, plastic boxes, and syringes once discovering the COVID-19 vaccine, has been mature worldwide may be a notable warning to the climate and public well-being. The amount of the doubted patients, designation and prescription of the many sufferers, and ultimately medical aid have pointed to abundant communicable medical trash, principally plastic. the event inside PPE production generates associate degree equal quantity into the scrap stream, combined with environmental hazards with the trash administration chain, notably inside nations as well as associate degree undeveloped base. An unprecedented increase in such biomedical waste, courtesy of prolonged pandemic has resulted a serious concern among global leaders towards its disposal. Thus, individual measures and precautions can play an important role in turning the tide in favour of prolonged sustenance of humankind and environment (Narayane*et al.,* 2020).

Even before the pandemic, PPE kits were known to its target user, i.e. medical professionals, laboratory attendants and others. Common household were introduced to it mostly in the pandemic. To evaluate the level of awareness of PPE among the regular population, a web-based online survey was conducted, concerning about the knowledge of awareness, usage and disposal of PPE kits.

MATERIALS AND METHOD

Owing to the lockdown restrictions imposed during the pandemic, an online web-based survey was conducted as an alternative to offline door-to door survey. The questionnaire was prepared in Google Forms, due to the ease in generating, distributing and compiling of data. It was circulated via social media platforms, primarily whatsapp messages, as it is easily accessed by the regular population. The questionnaire was made in simple English, with different sections consisting title of the survey, objective of survey, declaration of

anonymity for demographic data collected (name, email, phone number) and the survey questions.

Following are the questions posted in the survey-

Table1: The list of questions that were a part of the e-survey

Question Number	Question asked in the survey
Q 1	Do you know PPE kit?
Q 2	Where can one buy PPE kit?
Q 3	Will personal protective equipment protect against a specific disease?
Q 4	Should caregivers use PPE to help protect against infection when caring for a sick person at home?
Q 5	Can the PPE kit be reused?
Q 6	Can the disposable PPE kit be washed and reused?
Q 7	When can the PPE kit be shared between people?
Q 8	Does every piece of PPE provide the same level of protection?
Q 9	How do you think the PPE kit should be disposed?
Q 10	Do you think a used PPE kit a Biohazard?
Q 11	What will you do if you face a problem with the PPE kit?
Q 12	How do manufacturers ensure personal protective equipment (PPE) is safe and effective?

RESULTS OF THE SURVEY

A total of 160 participants responded to the survey. Majority of the participants (77%) belonged to the 15 to 25 age group (students) while the rest comprised of age between 25 to 60.

Following is the diagrammatic and tabular representation of the questionnaire in the survey.

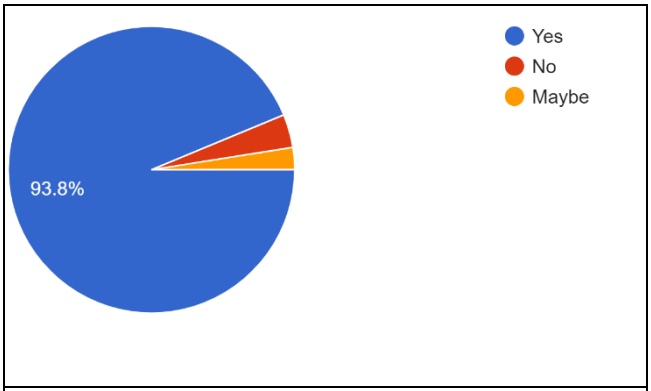

Figure 1: Response for "Do you know PPE kit?"

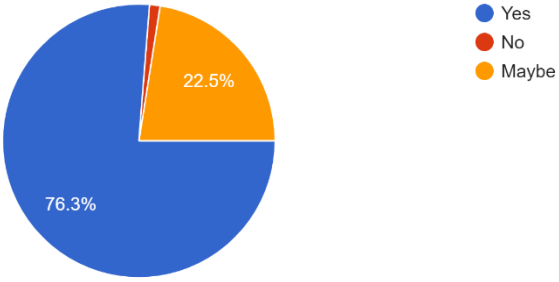

Figure 2: Response for "Will personal protective equipment protect against a specific disease?'

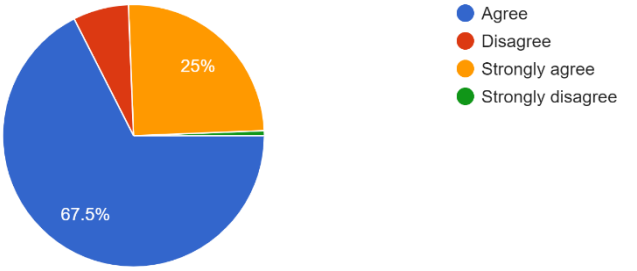

Figure 3: Response for "Should caregivers use PPE to help protect against infection when caring for a sick person at home?"

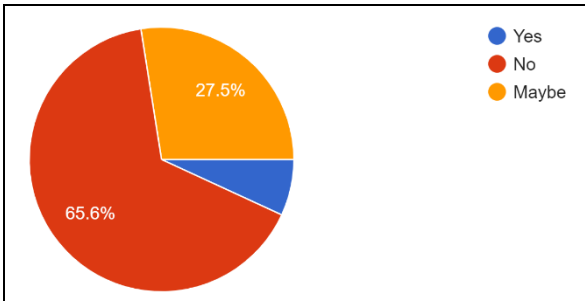

Figure 4: Response for "Can the PPE kit be reused?'

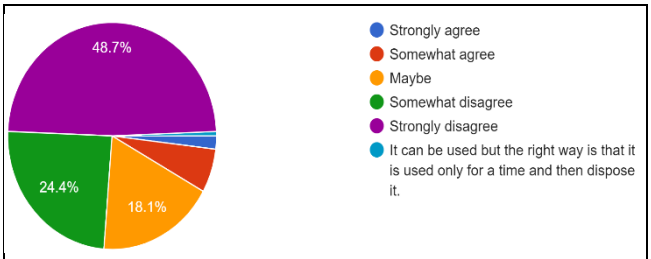

Figure 5: Response for "Can the disposable PPE kit be washed and reused?"

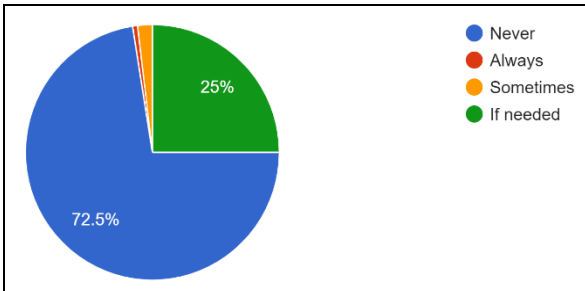

Figure 6: Response for "When can the PPE kit be shared between people?"

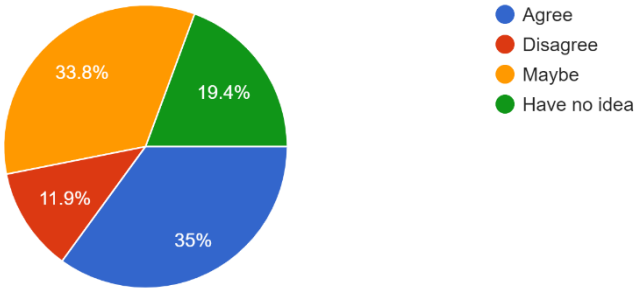

Figure 7: Response for "Does every piece of PPE provide the same level of protection?"

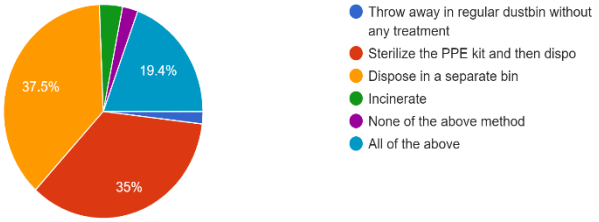

Figure 8: Response for "How do you think the PPE kit should be disposed?"

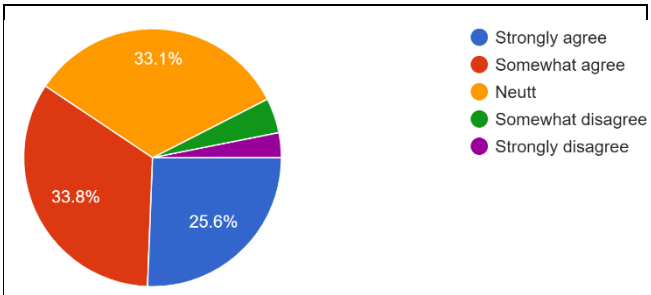

Figure 9: Response for "Do you think a used PPE kit a Biohazard?'

Table 2: Summarization for multiple choice type questions asked in the survey

Q 1	**Response type**	Yes	No	Maybe	-	-	-
	%	93.8	3.7	2.5	-	-	-
Q 3	**Response type**	Yes	No	Maybe	-	-	-
	%	76.3	22.5	1.2	-	-	-
Q 4	**Response type**	Strongly agree	Agree	Disagree	Strongly disagree	-	-
	%	25	67.5	6.9	0.6	-	-
Q 5	**Response type**	Yes	No	Maybe	-	-	-
	%	6.9	65.6	27.5	-	-	-

Q 6	**Response type**	Strongly agree	Somewhat agree	Maybe	Somewhat disagree	Strongly disagree	preferable to use once and dispose
	%	1.9	6.3	18.1	24.4	48.7	0.6
Q 7	**Response type**	Always	Sometimes	If needed	Never	-	-
	%	0.6	1.9	25	72.5	-	-
Q 8	**Response type**	Agree	Maybe	Disagree	No idea	-	-
	%	35	33.8	11.9	19.4	-	-
Q 9	**Response type**	Regular dustbin without treatment	Sterilize and dispose	Dispose in separate bin	Incinerate	All of the above	None of the above
	%	1.9	35	37.5	3.7	19.4	2.5
Q 10	**Response type**	Strongly agree	Somewhat agree	Neutral	Somewhat disagree	Strongly disagree	-
	%	25.6	33.8	33.1	4.4	3.1	-

Summary of responses obtained for descriptive question Q 2:

Majority of participants stated that medical shops, hospitals and healthcare centres can be accessed to obtain a PPE kit. Many participants also added online platforms for online ordering purposes. The few remaining participants were not sure regarding the source.

Summary of responses obtained for descriptive question Q 11:

Many participants were of the opinion that a faulty PPE kit should be discarded, while some added complaining to the manufacturing or retail centres. Most of the responding participants also have not actually used the kit themselves, as a result they did not answer the question.

Summary of responses obtained for descriptive question Q 12:

Some provided technical responses, stating leak protection, filtration capacity, adequate sealing, tear snag resistance; while others simply responded as testing. Most of the participants, however were not sure about the actual process involved with PPE testing.

CONCLUSION

Due to its versatility, Personal Protective Equipment has been used not only by frontline workers and medical practitioners, but also in various other aspects, even before the pandemic derived lockdowns came into effect. COVID pandemic, on the other hand made PPE a sought after necessity, increasing its demand. This resulted in supply shortage of PPE for those who required it the most. Additionally, incorrect use and disposal of it by uninformed or untrained population can pile upon the existing problem (Jessop, 2020). This work attains the dual objective of providing information on the working, usage and disposal of PPE; along with gathering information from the general population regarding their understanding for the same. The survey results reflect that the people are now fairly aware regarding PPE with respect to its need, how and when it is useful and how it is to be operated. This can be attributed due to the awareness campaigns undertaken by the local government and electronic media during the continuation of a prolonged pandemic. However, as many of the participants themselves have not directly used it themselves, there is still some ambiguity among the people, particularly with respect to means of disposal. The analysis presented herewith can prove crucial for local governments, NGOs, PPE manufacturers, etc to formulate an action plan to better spread accurate information among the general population.

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