ISSN: 2755-0125

Journal of Virology Research & Reports

SCIENTIFIC Research and Community

Editorial

Open Access

Personal Protective Equipment Interventions in the Era of COVID-19 Pandemics

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Received: December 30, 2020; **Accepted:** January 04, 2021; **Published:** January 08, 2021

A recent study in China demonstrated that the rapid surge of COVID-19 in healthcare workers (HCWs) may be the lack of effective protection measures. This study revealed that there were no significant differences in the use of gloves or medical masks among the three group of 1) intensive care unit (ICU) staff, 2) staff working in the fever outpatient department, general patient room, Fangcang shelter hospital, emergency department, cleaning area, imaging examination area, and transfer vehicle, and 3) staff working in the general outpatient department, community, pharmacy, and administrative area. Nevertheless, all other types of personal protective equipment (PPE) (N95/FFP2 respirator, face shield/goggles, isolation gown, medical protective uniform, and positive pressure headgear) were used most group 1 and HCWs in group 2. Skin injury was the most common type (62.3 %) of PPE-associated adverse events (87.3 %), dyspnea (61.8 %), dizziness (57.8 %), and headache (53.8 %). Greater risks of adverse events occurred in both doctors (30.2 %) and nurses (66.5 %) compared to other types of HCWs (3.3 %, both $p < 0.05$). The negative results of the reverse-transcriptase-polymerase-chain-reaction tests in all three group participants accompanying negative results of serological tests in 70 % of all participants suggested the efficacious measure of PPE for the SARS-CoV-2 (COVID-19) nosocomial transmission. The need for guidance on rationalizing, prioritizing, and grading the PPE use due to HCWs' infection risk is supported by the efficacy of different PPE among HCWs in different working areas. The basic emergency guidance of PPE for protecting HCWs should be issued at the earliest stage of an epidemic, not months later. Although 98.6 % of HCWs revealed high adherence level to PPE protocols, PPE was commonly related to adverse events in the study participants both physically and psychologically.

The examples of PPE that are recommended by the World Health Organization (WHO) are as the followings. 1) Medical mask for healthcare workers, patients, and general public has 98 % droplet filtration, good breathability, and should be preferably fluid resistance, 2) Face shield is made of clear plastic, adjustable band to attach firmly around the head and fit snuggly against the forehead, preferable fog resistant. Face shield completely covers the sides and length of the face and may be re-usable (made of robust material which can be cleaned and disinfected) or disposable, 3) Particulate respirator has minimum 94 % or 95 % of good particulate filtration, and 4) Non-sterile examination glove is made of nitrile (preferable), latex, and polychloroprene or polyvinyl chloride (PVC). The examination glove should be minimum 230 mm. of total length and minimum 0.05 mm. of thickness.

In conclusion, the need for PPE design improvements is urgently highlighted, particularly with public participation and contributions.

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Citation: Attapon Cheepsattayakorn, et al (2021) Personal Protective Equipment Interventions in the Era of COVID-19 Pandemics. Journal of Virology Research & Reports. SRC/JVRR-125. DOI: https://doi.org/10.47363/JVRR/2021(2)124.