



Self perceived adverse cutaneous reactions of personal protective equipment among health care worker's managing nCOVID 19 pandemic: An online questionnaire based study

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Abstract

Coronavirus disease 2019 (COVID-19), a pandemic caused by severe acute respiratory syndrome coronavirus type 2 (SARS-CoV-2). Various skin manifestations like vesicular, maculopapular, urticarial acroischemic lesions, and others have been found to be associated with COVID-19. Because of the strong infectivity of COVID-19, HCWs need to wear personal protective equipment (PPE), such as N95 masks, latex gloves, and protective clothing. Due to the use of PPE for very long time, many adverse skin reactions have developed. Therefore, the purpose of this study is to explore the adverse skin reactions among HCWs using PPE.

Materials and methods

The study is a multicentric online questionnaire survey to investigate skin problems in health care workers (HCWs) caused by the use of PPE and personal hygiene measures. We developed a questionnaire consisting of 32 questions using Google forms and circulated it via WhatsApp and Facebook groups and gathered the information.

Results:

A total of 128 HCWs were surveyed by questionnaire of which 53(41.4%) were males and 75(58.6%) were females. Age ranging from 22 years to 37 years with an average age of 27 years. Sixty (46.8%) participants were working in Bengaluru, 35(27.3%) were in Guntur, (25.9 %) rest were in other places. All HCWs were wearing N95 face mask, all were wearing gloves, 95 (74.2%) were wearing goggles, 82 (64%) were wearing face shields. Fifty-four (42.2%) HCWs had developed facial itching, 76(59.4%) had redness on nose, 54(42.2%) had pigmentation, 42(32.8%) had scar on nose from N95, 48 (37.5%) had acne, 9 (7%) had Skin abrasion, 26 (20.3%) had pustules. 70(54.7%) workers had dryness, 40(31.3%) had sweat contact dermatitis. Out of 128 HCWs, 38(29.6%) had preexisting acne of which 24(63.2%) had flare of acne within 2 days after starting using PPE.

Conclusion:

Our study provided details about causes and pattern of adverse reactions caused by the use of PPE and propose solutions, which can help HCWs who are still fighting COVID-19 to effectively reduce adverse skin reactions.

Keywords: COVID-19, HCWs, PPE, Skin reactions

Introduction

Since December 2019, the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) has rapidly spread worldwide has brought serious losses to mankind.¹ The transmission rate of COVID-19 is found significantly more than that of SARS, but its

pathogenicity is remarkably weaker than that of SARS according to the available epidemiological data.² Because of the strong transmission of COVID-19 and the uncertainty of the infection status of patients, front-line healthcare workers (HCWs) are at a greater risk of contracting the infection during the

management of COVID patients. As a result, prevention measures against COVID-19 disease transmission like personal protective equipment (PPE) and frequent hand washing have become a necessity.³ Personal protective equipment (PPE) are equipment designed to protect the wearer from the spread of infection or illness.⁴ The Ministry of Health and Family Welfare gave guidelines on the rational use of PPE. It recommends the use of goggles and face shields, the frame of which should provide a good seal to cover the eyes, nose, and mouth. Masks that are used should be either triple-layer medical mask or an N-95 Respirator mask. If available, nitrile gloves are preferred over latex gloves to prevent contact allergic dermatitis caused by latex. Nonpowdered gloves are preferred to powdered gloves. Overalls or gowns, shoe covers, and headcovers are used to protect the torso, feet, and head.⁵ While these measures are effective against COVID-19 transmission but their detrimental effects on the skin. The objective of the study was to understand the prevalence and pattern of cutaneous manifestations among HCWs caring for COVID patients.⁶ However, existing studies on adverse skin reactions due to the use of PPE by HCWs are limited.

This study collected the results of online survey of adverse skin reactions caused by the use of PPE by HCWs in various tertiary care centres in South India during the COVID-19 outbreak. Combined with these results, we can determine the prevalence and characteristics of adverse skin reactions caused by PPE among HCWs in various tertiary care centres all over India. The findings of this study will help to determine whether long-term use of PPE poses significant occupational health risks and to suggest possible solutions.

Methods

The study was multicentric online questionnaire survey conducted in various centres of South India. The purpose of this study was to determine the problem of adverse skin reactions among HCWs who was using PPE for a long period of time. The study was cross sectional qualitative descriptive research. As a descriptive research method, quantitative descriptive research cannot only analyse the samples

qualitatively but can also combine qualitative and quantitative data obtained by statistics. Therefore, quantitative descriptive research is considered appropriate. In light of the fact that the purpose of this study is to explore the incidence of adverse skin reactions of HCWs who have been wearing PPE for a long period of time, a comprehensive summary is generated through quantitative descriptive design, which clearly reflects adverse skin reactions.

This study uses a purposeful sampling method to select qualified research objects. Purposeful sampling methods can collect useful information needed for this study by identifying different participants. Based on this method, we selected participants according to the following criteria: registered doctors or nurses; HCWs working Covid care centres in Victoria hospital, BMC&RI, Guntur, those often wearing PPE, such as N95 masks, latex gloves, and protective clothing; staff who are contacted with patients directly; and those willing to participate in the questionnaire survey. According to this standard, we selected a total of 128 HCWs who met the criteria.

All participants signed an informed consent form before the study. This survey was conducted by the distribution of questionnaires to participants who met the criteria. The questionnaire covers the duration of the use of masks, gloves, and protective clothing, as well as adverse skin reactions caused by their use. Participants who agreed to participate in the study were asked to sign an informed consent form on the date of data collection <https://form.jotform.com/reckoningrockyrmc/drrakeshranenonlinesurvey>

Results

A total of 128 HCWs were surveyed by questionnaire of which 53(41.4%) were males and 75(58.6%) were females. Age ranging from 22 years to 37 years with an average age of 27 years. Sixty (46.8%) participants were working in Bengaluru, 35(27.3%) were in Guntur, (25.9 %) rest were in other places. Fifteen (11.8%) health workers were working in screening center, 19(14.9%) were in intensive care unit and 63(49.2%) were in isolation wards, 28(21.8%) in emergency rooms. (Table 1)

Table 1: Working place of health care workers

Working place	Number
Screening center	15(11.8%)
Isolation wards	63(49.2%)
Emergency rooms	28(21.8%)
Intensive care units	19(14.9%)

Out of 128 HCWs, 25 (19.5%) HCWs working in a place with good air circulation, 92(80.5%) were working in a place with no good air circulation. All HCWs were wearing N95, all were wearing gloves, 95 (74.2%) were wearing goggles, 82 (64%) were wearing face shields. Twenty (16%) health workers were working for <4hrs, 59 (46%) for 4-6 hrs and 79(61.7%) for >6hrs.

Adverse reactions on face

Out of 128 HCWs who had worn N95 mask, 112(87.5%) participants had mild reaction,

15(11.7%) had moderate, none had severe reaction. Fifty-four (42.2%) HCWs had developed facial itching, 76(59.4%) had redness on nose, 54(42.2%) had pigmentation, 42(32.8%) had scar on nose from N95, 48 (37.5%) had acne, 9 (7%) had Skin abrasion, 26 (20.3%) had pustules.

Out of 82 HCWs who had worn face shield, 65 (79.3%) health workers had ear pain, 62 (75.6%) had headache, 12(14.6%) had dizziness, 51(62.2%) had patterned abrasions from face shield.(Table 2)

Table 2: Adverse effects on face

Adverse reactions	Number of health care workers (%)
Facial itching	54(42.2%)
Redness on nose	76 (59.4%)
Pigmentation	54 (42.2%)
Scars on nose	42(32.8%)
Acne	48(37.5%)
Pustules	26(20.3%)
Ear pain	65(79.3%)
Headache	62(75.6%)
Patterned abrasion	51(62.2%)
Skin abrasion	9(7%)

Adverse reactions on hands

Out of 128 HCWs who wore gloves, 20(15.6%) were wearing one pair of gloves, 52 (40.6%) were wearing 2 pair and 56(43.8%) were wearing 3 or more. One hundred and fifteen (89.8%) were latex and

13(10.2%) wearing non-latex. 98(76.6%) workers had dryness, 50(39.1%) had sweat contact dermatitis. Out of 128 HCWs who were using sterylum, 60(46.8%) workers had developed chapped skin, 41(32%) had irritation, 13(10.2%) had dermatitis of

hands bcoz of sanitizer. No secondary infection. (Table 3)

Table 3: Adverse effects on hands

Adverse reactions	Number of health care workers (%)
Dry skin	98(76.6%)
Itching and Rash	40 (31.3%)
Chapped skin	60(46.8%)
Sweat Dermatitis	50(39.1%)

Adverse reactions on body

Out of 128 HCWs, 104(81.3%) were wearing PPE body suit while working of which 96 (92.3%) participants were wet after doffing PPE, 60(57.7%) developed dry skin and 40(38.5%) developed itching and rashes. (Table 4)

Table 4: Adverse effects on body

Adverse reactions	Number of health care workers (%)
Dry skin	60 (57.7%)
Itching and rashes	40(38.5%)
Sweat dermatitis	40 (31.3%)

Adverse reactions on feet

Out of 128 HCWs, 66 (51.6%) were wearing PPE footwear while working of which 26 (39.4%) participants developed itching and 7 (10.6 %) had rashes on feet.

Flare of pre-existing skin problems

Out of 128 HCWs, 38(29.6%) had preexisting acne of which 24(63.2%) had flare of acne within 2 days after starting using PPE. Sixty-four (50%) out of 128 HCWs were washing hands 10 times / day. None had co morbidities.

Preventive measures taken by HCWs

Out of 128 HCWs, 80 (62.5%) health care workers had taken measures for prevention of skin problems with PPE of which 69 (86.3%) participants had applied moisturizers and 33(41.3%) applied cotton and micropore tape before wearing PPE. Fifty-five (68.8%) HCWs have felt that the measures taken has helped in prevention of cutaneous side effects.

Discussion

COVID-19 has been found to be associated with a variety of skin reactions, often related to a secondary immune mediated response following viral infection. The most common cutaneous manifestations in adults are generalized or localized maculopapular eruptions, urticaria, varicelliform rash, pseudochilblain and acro-ischemic lesions, livedoid lesions, erythema multiforme-like vasculitis, purpuric lesions, herpes lesions, acute generalized exanthematous pustulosis (AGEP)-like rash.⁷ On the other side, COVID-19 pandemic has affected skin of health care workers indirectly. Due to the highly contagious and nationwide spread of COVID 19, HCWs are required to wear PPE, such as N95 masks, latex gloves, and protective clothing.⁵ Healthcare workers (HCWs) who have to use personal protective equipment (PPE) while working to protect from COVID-19, have developed occupational dermatitis.⁸ Our study determined a pattern and prevalence of

adverse skin reactions in 128 health care workers wearing PPE.

In our study, the prevalence of adverse skin reactions were found to be 87.5%. In a study conducted by Kilaru KR et al, on 310 HCWs, prevalence was 44.19%.⁹ In our study, hand dryness was the most common adverse skin effect, followed by facial itching (42.2%). Other facial. Skin adverse effects are redness on nose (59.4%), pigmentation (42.2%), scar on nose (32.8%), acne (37.5%), pustules (20.3%). In Kilaru KR et al, hand eczema (43.80%) was the most common manifestation, followed by acne (22.63%), hair fall (18.98%), sweat dermatitis (11.68%), pressure dermatitis (10.22%), irritant contact dermatitis (7.30%).⁹

In a Chinese study at Hubei Province by Yuan X et al, a total of 275 participants in including 77 physicians, 197 nurses, and 1 technician were surveyed. The prevalence of PPE-related skin reactions was high in frontline medical staff in our research was 77.09% who had skin reactions, of which 16% suffered skin breakdown. Only 54.55% participants (150 of 275) took preventive strategies in advance, including moisturizers, dressings and ointments. 21 of those 150 participants had little knowledge about how to use these dressings appropriately and correctly.¹⁰ According to Lan et al, in a cross-sectional study conducted on 542, 526(97%) had reaction. Most common site being nasal bridge (83.1%) followed by cheek (78.7%), hands (74.5%), and forehead (57.2%).¹¹ In a cross-sectional study on 376 health care workers by Lin et al, found that dryness or scaling (68.6%) as most common adverse skin reaction followed by papules or erythema (60.4%), and maceration (52.9%) on hands (84.6%), cheeks (75.4%), nasal bridge (71.8%).¹² In a cross-sectional study on 337 health care workers by O'Neill et al, prevalence of dermatosis was 93.5%, irritant contact dermatitis (59%) was more common followed by acne or rosacea (17%), atopic eczema (12%), allergic contact dermatitis (7%), and facial pressure injury (3%).¹³ Foo et al reported the most common adverse skin reactions were acne, facial itching, and rash.¹⁴ Headache was highlighted in Lin research.¹² It probably because the participants in Lin research have been wearing N95 mask for more than one year and the long-term utilization could result in hypoxemia and hypercapnia which led to headache.

In this study, we found that the most common adverse reaction of the N95 mask was nasal bridge scarring, followed by facial pruritus. Excessive pressure of the mask and the hardness of the metal clip may be the cause of scar on the bridge of the nose. The cause of itching may be discomfort due to wearing a mask for too long period of time or irritant contact dermatitis attributed to an allergic reaction to the mask material and wrapping the micropore all around the mask leaving no space.¹⁵

Since COVID-19 is found to be transmitted through contact, hand hygiene is one of the most important ways of preventing transmission.⁵ Wearing latex gloves can effectively prevent the chance of contact infection among HCWs. Reactions on hands may be because of hypersensitivity to latex or latex allergy or may be irritant contact dermatitis. Repeated hand washing with soap and detergent and not completely drying the hands. The most common symptoms were dry skin and itching.

Our study investigated the long-term use of PPE and found that most HCWs have adverse skin reactions when wearing masks, gloves, and protective clothing. These adverse skin reactions are usually moderate to severe. Advised all HCW to apply moisturiser before and after wearing mask, if any of the HCWs have erythema, burning sensation, itching then next day onwards they can apply mild steroid with moisturiser before and after wearing mask so that one can prevent adverse skin reactions becoming worse. Our study provided causes and pattern of adverse reactions caused by the use of PPE and propose solutions, which can help HCWs who are still fighting COVID-19 to effectively reduce adverse skin reactions.

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