



A Healthcare Worker's Adverse Skin Reaction to the Use of Personal Protection Equipment and Frequent Hand Washing in COVID 19

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Background: Due to the increasing number of covid 19 cases, HCWs must use personal protective equipment (PPE) such as N95 masks, latex gloves, and protective clothes due to the significant infectivity of COVID-19, which may cause unpleasant skin responses.

Materials and Methods: The Demographic data of 89 individuals, duration of work in covid facilities, history of skin pre-existing skin disease, information about personal protective kit used that is a type of mask used (N95 with ear strap or head strap, FFP2, cloth mask, surgical mask), type of gloves used (nitrile, latex, rubber, plastic), frequency of hand washing and frequency of use

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of hand sanitizer and any adverse skin reaction seen by their use was collected from a participant who fulfilled the inclusion criteria by the distribution of questionnaires.

Results: Out of 89 individual, 73 individual showed adverse skin reactions to the use of mask, including nasal bridge scarring (10.11%), facial itching (19.10%), skin damage (4.49%), dry skin (12.36%), and rash (8.99%), acneiform eruption (7.87%), indentation and ear pain (11.24%). Facial itching was the most common adverse skin reaction in individuals using masks. Dry skin (28.08%) and Itching (17.97 %) were common adverse skin reactions. Twenty-nine individuals experienced adverse skin reactions to the use of PPE. The most common skin reactions were dry skin (12) and itching (10).

Conclusion: Due to the long-term use of PPE, masks, gloves, and adverse skin reactions, healthcare workers are prone to adverse skin reactions; a proper suggestion made that the use of cloth mask under N95 OR FFP2 mask can help reduce such adverse reactions.

Keywords: HCW; COVID-19; PPE; mask; gloves; adverse skin reactions.

1. INTRODUCTION

Since the beginning of the twenty-first century, coronavirus outbreaks have caused significant societal losses, the most serious of which is the severe acute respiratory syndrome coronavirus (SARS) [1]. A novel coronavirus was discovered in Wuhan, China, in December 2019, generating global interest and spreading quickly to neighboring nations, including India.

According to current statistics, COVID 19 has a substantially higher transmission rate than SARS, although its pathogenicity is significantly lower. To fight against and control this epidemic, the government of India has taken specific measures such as social distancing, no social gathering, lockdown, and strict quarantine policy. Because of the high transmission of COVID 19 and the uncertainty of the patient's COVID 19 status, health care workers such as doctors, nurses, and ward attendants are at risk of infection. As a result, health care workers are given a personal protective kit that includes an N95 mask, gloves, and personal protective equipment (PPE) that must be worn for hours [2].

However, the use personal protective kit has resulted in adverse skin reactions such as itching, rash, dryness, erythema, blemishes, pigmentation, etc. At present, there is limited data on adverse skin reaction to use of personal protective equipment. The study aims to collect the data regarding adverse skin reactions in health care workers using mask, gloves, and PPE for a longer duration. We can evaluate the prevalence and features of adverse skin reactions in health care workers [3] by integrating these findings. The study's findings will help us evaluate whether long-term usage of masks, gloves, PPE, hand sanitizer, and regular hand

washing poses a significant occupational health risk and provide recommendations for viable solutions.

2. MATERIALS AND METHODS

2.1 Design

The study was conducted at Shalini Tai Meghe hospital, Hingna, Nagpur, tertiary care hospital situated in central India. The following study is a type of quantitative descriptive research. This study aimed to calculate the incidence of adverse skin reactions in health care worker personal protective equipment for a long period.

2.2 Setting and Participants

Purposeful sampling method was used to select the participants. Based on this method, selection of participants was made. Accordingly, participants selected were registered doctors, nurses, attendants, healthcare workers working in COVID 19, those who are repeatedly wearing personal protective equipment such as N95 mask, latex gloves and PPE, the staff coming in direct contact with COVID 19 patients and those who are willing to participate in the study. According to following criteria 89 such participants was selected.

2.3 Data Collection

The Demographic data including name, age, sex, occupation, socioeconomic status, duration of work in covid facilities, history of skin pre existing skin disease or history of any systemic disease. Other important information about personal protective kit used that is type of mask used (N95 with ear strap or head strap, FFP2, cloth mask, surgical mask), type of gloves used (nitrile, latex,

rubber, plastic), frequency of hand washing and frequency of use of hand sanitizer and any adverse skin reaction seen by their use was collected from participant who fulfilled the inclusion criteria by distribution of questionnaires. Participant who fulfilled the criteria and who agreed to participate in study were asked to sign an informed consent form on the date of data collection. Finally the data was collected from 89 participant and statistical analysis was done.

3. RESULTS

Total 89 health care worker including doctors, nurses, attendants and others were surveyed by the above questionnaire. All 89 healthcare worker positively responded to the questionnaire among which 54 were male and rest 35 were women including 52 doctors, 33 nurses and 4 were attendants.

3.1 Mask

Among 89 participant 13 used N95 mask, 59 used FFP2 mask, 11 used cloth mask and 6 of them were using surgical mask. Out of 89 individual 73 individual showed adverse skin reaction to use of mask including nasal bridge scarring (10.11 %), facial itching (19.10%), skin damage (4.49%), dry skin (12.36%), and rash (8.99%), acneiform eruption(7.87%), indentation and ear pain (11.24%). Facial itching was the most common adverse skin reaction seen in individual using mask. The nasal bridge scarring was seen more among 21 to 30 years individuals and was seen more common in individual using N95 OR FFP2 mask having head strap and was less common in those individual using cloth mask under it and not seen in those wearing only cloth mask. Indentation and ear pain was more common in individual using mask with ear strap and less among individual using mask with head strap. Dry skin was seen in 11 out of 89 individuals and was found more common in 41 to 50 years age group. Acniform eruptions was

seen in only in 7 individuals and cheeks and chin were more prominently involved.

3.2 Latex Gloves, Frequent Handwashing and Use of Hand Sanitizer

Among 89 individual 62 used latex gloves, 11 used nitrile gloves, 7 used rubber gloves , 9 used plastic gloves and among these 89 individuals, 58 showed adverse skin reaction to use of gloves. The average duration of use of gloves was 5 to 6 hours day among doctors and 7 to 8 hours among nurses and other healthcare workers where as the average frequency of hand washing was 5 to 6 times a day and the average use of hand sanitizer was 5 to 10 times day in individual working in covid facilities and 15 to 20 times in individual working in non covid facilities. Dry skin (28.08%) was the most common adverse skin reaction to use of gloves, frequent hand washing and use of hand sanitizer more than 15 times a day and it was seen more in individual using latex and nitrile gloves and in age group 41 to 50 years. Itching (17.97%) was the second most common adverse skin reaction after dry skin which was also more seen in 41 to 50 years age group. Palmer hyperhidrosis (5.61%) and skin soaked with sweat (8.68%) were adverse skin reaction seen in individual between 31 to 40 years. Eczema was seen in older individual that is 41 to 50 years , and those using hand sanitizer more frequently that is more than 25 times a day.

In our study out of 89 individual, 77 individual wore PPE 5 times a week for an average duration of 3 to 6 hours a day. Twenty-nine individual experienced adverse skin reaction to use of PPE. The most prevalent adverse skin reactions among 29 people were dry skin (12) and itching (10). Due to prolonged use of PPE, both dry skin and itching were more prevalent in young people aged 21 to 30. Skin rash (3) and wheals (2) were also noticed among individuals.

Table 1. Characteristic of participants according to age and sex

Age	Sex	Participant	Percentage
21 to 30 Years	Male	37	41.57 %
	Female	22	24.71 %
31 to 40 Years	Male	16	17.97 %
	Female	10	11.23 %
41 to 50 Years	Male	1	1.12 %
	Female	3	3.37 %
Total		89	100 %

Table 2. Types of different mask used by individual

Type of mask	No. of participant
N95 MASK	13
FFP2 MASK	59
CLOTH MASK	11
SURGICAL MASK	6
N95/FFP2 WITH CLOTH MASK	5

Table 3. Adverse skin reaction by use of mask

Type of gloves	No. of participant
LATEX	62
NITRILE	17
RUBBER	7
PLASTIC	3

Table 4. Type of gloves used by individual

	21-30 Years (N=59)	31-40 Years (N=26)	41-50 Years (N=4)	Total (%)
Nasal bridge scaring	7 (11.8%)	2 (6.89%)	-	9 (10.11%)
Facial itching	13 (22.03%)	3 (11.53%)	1(25%)	17 (19.10%)
Damage	3 (5.08%)	1 (3.84%)	-	4 (4.49%)
Indentation & ear pain	6 (10.16%)	3 (11.53%)	1(25%)	10 (11.24%)
Rash	5 (8.47%)	2 (6.89%)	1(25%)	8 (8.99%)
Dry skin	7 (11.86%)	2 (6.89%)	2(50%)	11 (12.36%)
Wheals	3 (5.08%)	1 (3.84%)		4 (4.49%)
Erythema erosion	2 (3.38%)	2 (6.89%)		4 (4.49%)
Skin desquamation	1 (1.69%)	1(3.84%)		2 (2.25%)
Acniform eruption	5 (8.47%)	2(3.84%)		7 (7.87%)

4. DISCUSSION

Due to nationwide spread of COVID19 across all the states, the Healthcare workers have to use mask, gloves and PPE [4]. This protective clothing or equipment along with protections also shows some adverse skin reactions among healthcare workers. In this study we evaluated the adverse skin reaction in healthcare worker by personal protective clothing and equipments, this study will help healthcare worker to take proper measures to reduce the adverse skin reactions. In this study 89 healthcare worker providing services in COVID 19 facilities were taken as participants, and questionnaire proforma was made to conduct the study, ultimately 89 questionnaire was collected the common adverse skin reaction to use of mask , gloves , hand washing , hand sanitizer and PPE were found [5-7]. In order to avoid the spread of respiratory tract infections, medical masks are used. The mask may cover the wearer's mouth and nose and, when worn correctly, can help

prevent the transmission of respiratory viruses and germs. During the 2003 SARS outbreak, the World Health Organization and the US Centers for Disease Control and Prevention released preventative measures in the management of SARS patients, recommending that the time spent exposed to air be minimised to lessen the risk of airborne droplet transmission [8,9]. In particular, it is recommended to use protective masks that meet the certification of the National Institute of Occupational Safety and Health. "N" stands for the National Institute of Occupational Safety and Health, and "95" indicates its filtering efficiency. As a consequence, the mask has a filtration effectiveness of 95% when filtering particles smaller than 300 nm. The N95 mask can filter out 95% of airborne particles and fits snugly on the face, preventing the inhalation of tiny infectious particles that can travel great distances through the air after a sick person coughs or sneezes. Tuberculosis, chicken pox, SARS, and measles are among the diseases that need the use of a N95 mask [10].

COVID-19 has been found to be transferred by contact, hence hand protection is one of the most essential measures to avoid infection with COVID-19. HCWs can easily avoid contracting an illness by using latex gloves. Dry skin, itching, and rash were the most prevalent side effects of using latex gloves in this research. It was comparable to the skin responses that occurred when people wore gloves during SARS. There might be three explanations for these occurrences. The first is Immunoglobulin E-mediated latex hypersensitivity; the second is latex allergy; and the third is irritating contact dermatitis, which occurs when hands are repeatedly washed with soap and detergent and not thoroughly dried. As a result, the glove's interior will be unable to absorb air, causing irritation [11]. It's most likely produced by the stimulation of talcum powder in the gloves if it's a dry powder glove. It is vital to rinse off the soap or detergent before putting on gloves and to dry one's hands before putting on gloves in this situation [12]. There shouldn't be too much talcum powder inside the gloves if they're dry. Wearing a layer of plastic gloves inside the latex gloves is another option. Irritant dermatitis can be avoided by taking these precautions [13]. Latex allergy testing is required if the symptoms of irritating contact dermatitis cannot be alleviated, and latex gloves should be avoided. Using moisturisers on a daily basis can also help to avoid dry skin and eczematous changes [14]. To protect themselves, HCWs must wear protective garments for lengthy periods of time every day. As a result, negative skin responses have occurred. HCWs who have been wearing protective garments have had less adverse skin responses. Itching and dry skin were the most prevalent complaints. The major cause of these circumstances is most likely the humid protective apparel and the requirement to wear it for an extended amount of time. The foregoing symptoms can be significantly reduced by replacing protective garments on a regular basis [15].

5. CONCLUSION

Long-term usage of masks, gloves, and PPE in HCWs resulted in severe skin responses, according to our research. Because most HCWs continue to use the equipment, the adverse skin responses are generally modest. As a result, the user will not seek medical advice or self-medicate. Itching and redness were the most common skin side effects of PPE in our research. As a result, we propose that HCWs be

prescribed second-generation antihistamines or glucocorticoids if they experience unfavourable skin responses. They should consult a dermatologist if any major adverse skin responses to PPE occurred, or if medication delivery was unsuccessful. There have been no reports of negative skin responses associated with the use of PPE in COVID-19 to yet.

CONSENT

As per international standard or university standard, Participants' written consent has been collected and preserved by the author(s).

ETHICAL APPROVAL

As per international standard or university standard written ethical approval has been collected and preserved by the author(s).

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Sohrabi C, Alsafi Z, O'Neill N, et al. World Health Organization declares global emergency: A review of the 2019 novel coronavirus (COVID-19). *Int J Surg*. 2020;76:71–6.
2. Yang Y, Peng F, Wang R, et al. The deadly coronaviruses: The 2003 SARS pandemic and the 2020 novel coronavirus epidemic in China. *J Autoimmun*. 2020;109:102434.
3. Wu YC, Chen CS, Chan YJ. The outbreak of COVID-19: An overview. *J Chin Med Assoc* 2020;83:217–20.
4. Buran, T., Sanem Gökçe Merve Kılınc, & Elmas Kasap. Prevalence of extraintestinal manifestations of ulcerative colitis patients in Turkey: Community-based monocentric observational study. *Clinical Medicine and Medical Research*. 2020;1(2):39-46. Available:<https://doi.org/10.52845/CMMR/2020v1i2a8>
5. Das A, Kumar S, Sil A, et al. Skin changes attributed to protective measures against COVID-19: A compilation. *Dermatol Ther*. 2020;33:e13796.
6. Desai AN, Mehrotra PD. Medical masks. *JAMA*. 2020;323:1517–8.
7. Daniel V, Daniel K. Perception of nurses' work in psychiatric clinic. *Clinical Medicine Insights*. 2020;1(1):27-33.

- Available:<https://doi.org/10.52845/CMI/2020v1i1a5>
8. Chia S, Koh D, Fones C, et al. Appropriate use of personal protective equipment among healthcare workers in public sector hospitals and primary healthcare polyclinics during the SARS outbreak in Singapore. *Occup Environ Med.* 2005;62:473–7
9. Yuliasti Eka Purnamaningrum, Yuni Kusmiyati, Herlina Tri Nugraheni, Waryana. Young age pregnancy and postpartum blues incidences *International Journal of Scientific Research and Education.* 2018;7812-19.
10. Daniel V, Daniel K. Exercises training program: It's effect on muscle strength and activity of daily living among elderly people. *Nursing and Midwifery.* 2020; 1(01):19-23.
11. Foo CC, Goon ATJ, Leow YH, et al. Adverse skin reactions to personal protective equipment against severe acute respiratory syndrome—a descriptive study in Singapore. *Contact Dermatitis.* 2006;55:291–4.
12. Lim EC, Seet RC, Lee KH, et al. Headaches and the N95 face-mask amongst healthcare providers. *Acta Neurol Scan.* 2006;113:199–202
13. Daniel V, Daniel K. Diabetic neuropathy: New perspectives on early diagnosis and treatments. *Journal of Current Diabetes Reports.* 2020;1(1):12–14. Available:<https://doi.org/10.52845/JCDR/2020v1i1a3>
14. Valsecchi R, Leghissa P, Cortinovis R, Cologni L, Pomesano A. Contact urticaria from latex in healthcare workers. *Dermatology.* 2000;201:127–31.
15. Larese FF, Bosco A, Fiorito A, et al. Latex symptoms and sensitisation in health care workers. *Int Arch Occup Environ Health.* 2001;74:219–23.
- Available:<https://doi.org/10.52845/NM/2020v1i1a5>

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