Prevention of Contact Dermatitis Due to Hand Hygiene in The Era of COVID-19

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ABSTRACT
Background: The severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) virus is known to cause COVID-19 (Coronavirus Disease 2019), and it is rapidly spreading throughout the world that it is declared as a global pandemic. Hand hygiene is widely promoted as it is recommended to reduce the risk of COVID-19 transmission. Contact dermatitis is one of the risks of hand hygiene campaign during the COVID-19. **Purpose:** This study aimed to assess the parents' level of knowledge before and after health education about contact dermatitis due to hand hygiene. **Methods:** This was a cross-sectional study, and the data was collected via questionnaires. This study involved 53 respondents. **Result:** There was a significant increase in respondents' knowledge level after being educated (Wilcoxon test, p=0.000), as evidenced in the mean score of pre-test and post-test evaluation. **Conclusion:** To lower the incidence, education on contact dermatitis prevention due to hand hygiene during the COVID-19 pandemic is required.

Keywords: contact dermatitis, hand hygiene, COVID-19, healthy lifestyle.

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BACKGROUND

An unknown case of pneumonia was first discovered at the end of 2019 in Wuhan, China. The severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) virus has been identified from examining the respiratory tract of an infected individual. The disease is known as Coronavirus Disease 2019 (COVID-19) and is rapidly spreading throughout the world. World Health Organization (WHO) declared COVID-19 a global pandemic on March 11, 2020, and efforts were made to reduce its transmission.[1,2] COVID-19 virus spreads through respiratory droplets, which can spread when infected individual talks, coughs, or sneezes. Transmission can also occur through direct contact with the patient's mucous membrane or indirect contact with a surface or object contaminated with the virus.[1,2]

To reduce the risk of transmission of COVID-19, the Centers for Disease Control and Prevention (CDC) recommends implementing hand hygiene as one of the important healthy lifestyles. Hand hygiene can be done in 2 ways, by washing our hands with soap and water or using a hand sanitizer that contains at least 60% alcohol. Proper hand hygiene is expected to reduce the risk of transmission of COVID-19.[3]

The American Contact Dermatitis Society (ACDS) anticipates contact dermatitis due to the implementation of hand hygiene practice because many health workers and the public focus on hand hygiene. During the COVID-19 pandemic in China, 66.1% of health workers washed their hands more than 10 times per day, but only 22.1% used a moisturizer after washing their hands. More hand washing without proper skincare can cause skin barrier disruption. This will increase the risk of contact hand dermatitis, and it can negatively affect the individual's quality of life during activities.[3,4]

A higher incidence of contact dermatitis during the COVID-19 pandemic is one of the risks of hand hygiene practices. However, this can be prevented if hand hygiene is done properly while maintaining proper skin barrier function. Providing education on proper hand hygiene practices, appropriate skincare, and prevention of contact dermatitis is expected to reduce the risk of contact dermatitis during the COVID-19 pandemic.[3,4] Preventative efforts on contact dermatitis can be achieved through health education presentations, educational video, and books. Health education would involve parents because mothers have a fundamental role in shaping family practices.

METHODS

This was a cross-sectional study, and the data was collected using questionnaires. The inclusion criteria

for this study were respondents who performed hand hygiene, as one of the healthy lifestyles, during the COVID-19 pandemic and were willing to participate in this study. Fifty-three subjects were given a pre-test on contact dermatitis due to hand hygiene practices, continued with online health education. The post-test questionnaire was given after the online health education session was completed. This study has been approved by the ethics committee of Faculty of Medicine Universitas Airlangga Surabaya, No. 117/EC/KEPK/FKUA/2021.

RESULT

A total of 53 subjects were included in this study, of which 4 (7.55%) were males, and 49 (92.45%) were females. The age range of the subjects was between 15-53 years old, with a mean age of 36.38 ± 6.13. Subjects were parents with diverse occupational backgrounds and domiciles. Table 1 describes the characteristic of the subjects.

Table 2 showed subjects' hand hygiene practices during the COVID-19 pandemic. Subjects used hand sanitizer or soap and water to perform hand hygiene. The most commonly used type of soap was antiseptic soap (79.25%). As many as 83.02% of subjects have used moisturizer daily.

Frequent hand hygiene has made 23 subjects (43.40%) experience contact dermatitis during COVID-19. A total of 82.61% of these 23 subjects used antiseptic soap, while the rest used non-antiseptic soap. The highest frequency of hand washing with soap and water was >10 times a day (69.56%), followed by 6–10 times a day (26.09%), and 0–5 times a day (4.35%). The most frequent use of hand sanitizer is 0–5 times a day (43.48%), followed by >10 times a day (34.78%), and 6–10 times a day (21.74%). Dry, scaly, and flaky skin were the most common complaints among these 23 subjects, followed by an itchy, burning sensation and redness of the skin. The degree of pain (VAS) experienced by the subjects also varied, with the largest percentage being on a score of 3 and 7 (each 26.09%). Most subjects did self-medication (52.17%), and the most commonly used treatment was moisturizer. In general, the life quality of subjects with contact dermatitis symptoms in this study was quite good, as indicated by the DLQI score (Table 3)

Table 4 showed an elevated mean score and statistically significant difference between the pre-test and post-test mean scores after the education (Wilcoxon test, p=0.000). This result indicated an increase in subjects' knowledge after the education.

Table 1. Subject characteristics

Variable	Frequency	Percentage (%)
Age Group		
15–24 years old	1	1.88
25–34 years old	19	35.85
35–44 years old	29	54.72
45–54 years old	4	7.55
Total	53	100.00
Sex		
Male	4	7.55
Female	49	92.45
Total	53	100.00
Occupation		
Housewife	15	28.30
Teacher	14	26.41
Healthcare worker	1	1.89
Architect	1	1.89
Entrepreneur	1	1.89
BUMN / BUMD employee	3	5.66
Private sector employee	14	26.41
Civil employee	4	7.55
Total	53	100.00
Domicile		
Surabaya	47	88.68
Outside Surabaya	6	11.32
Total	53	100.00

Table 2. Hand hygiene practices during Coronavirus Disease 2019

Variable	Frequency	Percentage (%)
Frequency of handwashing with soap and water during the COVID-19 pandemic		
0–5x/day	6	11.32
6–10x/day	17	32.08
> 10x/day	30	56.60
Total	53	100.00
Type of soap		
Non-antiseptic	11	20.75
Antiseptic	42	79.25
Total	53	100.00
Frequency of using hand sanitizer during the COVID-19 pandemic		
0–5x/day	20	37.74
6–10x/day	21	39.62
> 10x/day	12	22.64
Total	53	100.00
Daily use of moisturizer		
Yes	44	83.02
No	9	16.98
Total	53	100.00

COVID-19 = Coronavirus Disease 2019

Table 3. Contact dermatitis history during Coronavirus Disease 2019

Variable	Frequency (n=23)	Percentage (%)
Clinical symptoms of hand dermatitis*		
Dry	22	95.65
Scaly	22	95.65
Flaky	22	95.65
Itchy	4	17.39
Burning sensation	3	13.04
Redness	1	4.38
*each subject can have > 1 symptoms		
VAS		
0	0	0
1	0	0
2	3	13.03
3	6	26.09
4	1	4.35
5	4	17.39
6	1	4.35
7	6	26.09
8	1	4.35
9	0	0
10	1	4.35
Total	23	100.00
Treatments		
No treatment	10	43.48
Self-medication	12	52.17
Seek doctors advice	1	4.35
Total	23	100.00
Type of medication*		
Moisturizer	21	91.30
Ointment	4	17.39
*each subject can get > 1 type of medication		
DLQI		
No effect on the patient's life	10	43.47
Small effect on the patient's life	9	39.13
Moderate effect on the patient's life	2	8.70
Very large effect on the patient's life	2	8.70
Extremely large effect on the patient's life	0	0
Total	23	100.00

VAS = Visual Analog Score; DLQI = Dermatology Life Quality Index

Table 4. Pre-test and post-test

	N	Minimum	Maximum	Mean	Std. Deviation	*p*-value*
Pre-test score	53	33.33	93.33	54.8430	14.82923	0.000
Post-test score	53	40.00	100.00	75.9751	14.16215	

*Wilcoxon test

DISCUSSION

Most participants were females (92.45%), and most participants were in the 35–44 y.o. age group (54.72%). Also, most of the participants were housewives and resided in Surabaya. Twenty-three subjects (43.40%) in this study developed contact dermatitis on their hands during the COVID-19 pandemic. Contact dermatitis is an inflammatory skin disease caused by contact with allergens or irritants. Contact dermatitis, especially hand dermatitis, in the general population has a point prevalence of around 4%, a 1-year prevalence of 10%, and a lifetime prevalence of 15%. Irritant contact dermatitis occurs more frequently than allergic contact dermatitis. Behavioral change during the COVID-19 pandemic, one of which is hand hygiene, has increased the occurrence of contact dermatitis on the hands. A study conducted by Alsaidan *et al.* reported that 34.8% of 2,356 participants experienced skin changes or symptoms on their hands during the COVID-19 pandemic.[5–7]

In this study, 56.60% of subjects washed their hands using soap and water more than 10 times a day, and 39.62% of subjects used hand sanitizer 6–10 times a day. Most of them used antiseptic soap. A total of 82.61% of the 23 people who experienced contact dermatitis symptoms also used antiseptic soaps.

In a pandemic, hand hygiene holds paramount importance in the prevention of COVID-19. WHO recommended hand hygiene practices to reduce its transmission. Research conducted by Alsaidan *et al.* showed that 88.7% of participants experienced changes in handwashing behavior and as many as 62.2% of participants that did not use hand sanitizers before the pandemic started using them during the pandemic.[7]

Hand hygiene can mean hand washing using water soap or the use of hand sanitizer. Soap is one of the irritant agents that can cause stratum corneum disruption, increasing skin permeability, skin penetration, and the risk of skin inflammation. Water and soap decrease the natural moisturizing factor in the skin layers, decreasing water-binding capacity, reducing skin hydration, and disrupting skin barrier function. Repeated exposure to the soap or alcohol-based hand sanitizer increases the risk of irritant contact dermatitis and possible secondary infection.[3,8]

Antiseptic soaps are soaps with added antimicrobial agents. These antimicrobial ingredients can disrupt the viral membrane's integrity. A study reported that antiseptics are the most common cause of occupational dermatitis, along with detergents and disinfectants.[3,9]

In this study, most subjects complained of dry, scaly, and flaky skin, and in some cases, complained of itching, burning, and skin rash. These complaints are the sign of dermatitis. As previously stated, contact dermatitis consists of irritant contact dermatitis (ICD) and allergic contact dermatitis (ACD). The difference in pathogenesis between these two. In ACD, skin lesions are caused by immune reactions and sensitization to some allergens mediated by T cells, which occur during the sensitization and elicitation phases. Both ICD and ACD have identical clinical appearances. Both can present with erythema, papules, and vesicles during the acute phase. Scaling, lichenification, and fissures are common during the chronic phase. Both acute and chronic ICD and ACD can cause pruritus, pain, or burning sensations, but ICD is more likely to cause a pain or burning sensation, whereas ACD is more likely to cause pruritus. A patch test can be performed to confirm the diagnosis and the etiologic agents.[6,10–12]

The degree of pain (VAS) experienced by the subjects also varied, with the largest percentage being on a score of 3 and 7 (each 26.09%). However, only 1 person consulted a doctor, 12 others did self-medication, and the remaining 10 did not take any medication. This may be because the complaints they experience mostly have no/little impact on their quality of life, as seen from the DLQI scores. The most common type of medication they used was moisturizers, followed by ointments. The majority of all subjects were also aware of the importance of using moisturizer. As many as 83% of 53 subjects have used moisturizer daily. Moisturizers help hydrate and prevent transepidermal water loss (TEWL), preserving skin barrier function and lowering the risk of ICD. Routine use of moisturizer protects and strengthens the skin's barrier function. Lipid-rich moisturizers are especially recommended for individuals with contact dermatitis. Anti-inflammatory agents, such as corticosteroids, can also be considered in cases of contact dermatitis. Topical corticosteroids are effective in treating localized acute ACD. The role of topical corticosteroids for ICD's management is still controversial. It has an anti-inflammatory effect, but

prolonged use can cause epidermal atrophy and increased sensitivity to irritants.[11,13]

Aside from irritant/allergen, a history of atopic dermatitis is a predisposing factor for contact dermatitis. The factors come from the host, such as a history of atopic dermatitis (AD). AD is a chronic relapsing skin disease that commonly affects infants and children. It is frequently associated with skin barrier dysfunction, allergen sensitization, and recurrent skin infections. Those factors cause individuals with a history of atopic dermatitis to be more likely to develop contact dermatitis if exposed to irritants.[14] According to WHO, there are three prevention strategies of contact dermatitis due to hand hygiene: opt for less irritating hand hygiene products, avoid activities with a risk of skin irritation, and use suitable moisturizing after practicing hand hygiene.[15,16]

Healthy skin can protect underlying tissues from the environment, including the prevention of excessive water loss. Healthy skin can be achieved by routine basic skincare that consists of cleaning, maintaining skin hydration, skin humidity, and skin protection. Skin can be cleaned with soap and water, continued by drying the skin immediately with a soft towel. Iodophors, antiseptic soaps (chlorhexidine, chloroxylenol, triclosan), detergents, alcohol-based products, and other additives in hand hygiene products have all been reported as irritants. Such soap usually has a high pH level (alkaline) and contains a surfactant, which can cause loss of natural oil and produce irritant contact dermatitis. The use of detergent-based products increases the risk of dermatitis by dehydrating the stratum corneum and removing protective lipids, leaving the skin more susceptible to irritation. Due to their lower lipid-dissolving effects, alcohol-based-hand-sanitizer are believed to be safer than detergents in terms of risk of ICD.[3,11,13,17]

Hands, as the most common part of the body, that contact with the cleanser (water, soap, or hand sanitizer), has a high risk of suffering from contact dermatitis, especially in the pandemic era. This condition can be prevented by regularly choosing normal pH level soap and using a suitable moisturizer, especially after a hand hygiene procedure. Healthy skin is reflected intact skin barrier (stratum corneum), normal, natural moisturizing factor (NMF) level, normal aquaporin (AQP3) expression, and balanced sebum secretion. Using the appropriate moisturizer product is an important procedure in preventing contact dermatitis in the pandemic era. Recommended daily use of moisturizer varies between 1 to 3 times because only approximately 50% of it remains on the skin surface after application.[11,13,17]

There are types of moisturizer to prevent contact dermatitis: occlusive, humectant, and emollient. Occlusive moisturizer is an oil-based agent that can prevent TEWL by creating a film layer on the skin, such as mineral oil, lanolin, squalene, paraffin, beeswax, propylene glycol. Humectant moisturizer has high water absorption capacity from the atmosphere and the deeper skin layer, such as urea, glycerin, sorbitol, hyaluronic acid, propylene glycol, alpha hydroxy acid. A good moisturizer combines humectant and occlusive agents to prevent TEWL and water absorption from deeper skin layers in low atmosphere humidity levels. Whereas emollients fill the intercellular lipid layer in the skin and soften the skin, such as lanolin, mineral oil, petrolatum.[11,13] Avoiding activities with a risk of skin irritation is also important to contact dermatitis prevention, such as reducing exposure to irritants at work and in daily activities. If necessary, wear personal protective equipment to avoid contact with irritants.[3,11]

The purpose of this study is to determine the level of subjects' knowledge about contact dermatitis due to hand hygiene. Pre-test and post-test questionnaires were used to assess subjects' knowledge levels. Education was provided through health education presentations, educational videos, and book about hand hygiene procedures and the prevention of contact dermatitis during the COVID-19 pandemic. The health education explained about contact dermatitis, including signs and symptoms, prevention, and know-how. The results showed an increase in the mean score and a statistically significant difference between the pre-test and post-test mean scores after education (54.84 vs. 75.97, p=0.000), indicating an increase in subject knowledge. This result shows that education intervention is effective and acceptable to parents in preventing contact dermatitis due to hand hygiene procedures during the COVID-19 pandemic.

Drexel *et al.* have conducted a study with educational interventions for AD patients and their caregivers. The parameters assessed were knowledge and behavior before and after receiving education. The results showed that education effectively increased knowledge and provided a change in habits of patients and caregivers, as indicated by patients' and caregivers' willingness to communicate and seek doctors' help. This is expected to improve these patients' quality of life. Knowledge has a significant impact on each individual, influencing their behavior in everyday life. The increased knowledge of parents, as the subjects in this study, is also expected to lead to improvements in self and family behaviors so that the incidence of contact dermatitis due to hand hygiene during the

COVID-19 pandemic can be reduced through educational intervention.[18,19]

The incidence of contact dermatitis due to hand hygiene during the COVID-19 pandemic is increasing, and it is caused by the public ignorance of hand hygiene guidance. Therefore, education intervention regarding the prevention of contact dermatitis due to hand hygiene is required to reduce its incidence.

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