



RELATIONSHIP OF HAND SANITIZER USAGE FREQUENCY WITH THE INCIDENCE OF IRRITANT CONTACT DERMATITIS DURING COVID-19 PANDEMIC

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ABSTRACT

Background: Irritant Contact Dermatitis (ICD) is an eruption of the skin caused by the non-immunologic inflammatory response of the skin to the irritant agents. The government urged to implement health protocols 3M, one of them is hand hygiene by used hand sanitizer to prevent the spread of COVID-19 infection. Repeated use of hand sanitizer can cause skin irritation and inflammatory response such as dryness, cracks, and other symptoms of ICD. **Objective:** To analyze the relationship between the frequency of use of hand sanitizer and the incidence of ICD. **Methods:** Observational analytics study cross-sectional design. The research subject were 260 medical faculty students of Diponegoro University who had to agree with informed consent, filled questionnaires and qualified by research criteria. Diagnostic of ICD based on questionnaires and physical examination of ICD. The statistical analysis data was used Chi-square test. **Results:** The results showed after analyze data use Chi-square test that there was not significantly related frequency use the hand sanitizer to the incidence irritant contact dermatitis during the COVID-19 pandemic with a p-value is 0,078 ($p>0,05$). The most frequent use of hand sanitizers is 5-10 times a day (56,5%), the most symptoms in ICD are dry, scaly, and peeling skin (30%), and the incidence of ICD due to the use of hand sanitizers are 33,5%. **Conclusion:** There was no significant relationship between frequency of use of hand sanitizer and irritant contact dermatitis during pandemic the COVID-19.

Keywords: COVID-19; Hand Hygiene ; Hand Sanitizer ; Irritant Contact Dermatitis.

INTRODUCTION

Irritant contact dermatitis (ICD) is a disease of acute or chronic inflammation on the skin due to recurring contact to irritant agents (chemical, physical, or biological) that may induce the destruction of skin barrier and the exertion of pro-inflammatory cytokines.^{1,2} Characteristics of this illness are erythema, papules, pustules, plaque, edema, vesicles, bulla, and hyperpigmentation with burning and itching sensation.¹⁻³

Based on global epidemiology research, it is found that 80% of work-related skin disease is classified as ICD.¹ Another study on repetitive usage of hand sanitizer and soap during COVID-19 tells us that 74% of research subject had suffered from contact dermatitis.⁴ Other research on health workers shows that 21% of them had hand dermatitis due hand disinfectant usage of over 50 times during work.⁵ The prevalence of contact dermatitis is higher in women, old age, and individuals with history of atopic dermatitis.³ Epidemiology survey shows that ICD incidence is found in 66% out of 97% that has occupational contact dermatitis in Indonesia.⁶

Pathogenesis of ICD involves two mechanisms, which are skin barrier destruction and inflammation

response.² The most important characteristic of skin barrier is Transepidermal Water Loss (TEWL), which maintains skin hydration.⁷ Irritant agent will induces irritation and skin destruction by disrupting intercellular lipid layer structure in stratum corneum, edema, and protein denaturation which in turn will damage the skin up to the dermal layer.⁸ Inflammation response will create skin damage that activates inflammatory cells to move towards irritated area and induces clinical features of ICD.⁹

Corona Virus Disease-19 (COVID-19) is an illness that has been stated by WHO as a global pandemic.¹⁰ Indonesian government has recommended the implementation of 3M health protocol to stop the spread of COVID-19.^{11, 12} One of the component of this protocol is to maintain hand hygiene by using hand sanitizer or washing hands with soap and running water.^{11, 12} Hand sanitizer has proven to be quick and effective in killing 99.9% of microbes.^{13, 14} Alcohol-based hand sanitizer comprised of ethanol, hydrogen peroxide, and glycerol is recommended by WHO.¹³ The recurring usage of hand sanitizer may cause skin to break and peel of.¹⁵

Based on the description given, the researchers are interested in creating a study to understand the



relation of hand sanitizer usage frequency with the incidence of ICD during COVID-19 pandemic.

METHODS

This research is an analytical observational study with cross-sectional design. It was conducted in the area of Faculty of Medicine, Diponegoro University through online method, with the research subjects staying in their own houses due to COVID-19 pandemic during the period of April-July 2021. Target populations in this study are all students who suffer from ICD during COVID-19 pandemic. Reasonable populations in this study are all students of Faculty of Medicine, Diponegoro University who suffer from ICD during COVID-19 pandemic.

Research subjects in this study are students of Faculty of Medicine, Diponegoro University that fulfill the inclusion criteria and not the exclusion criteria. Inclusion criteria in this research is male and female students of Faculty of Medicine, Diponegoro University with the age of 18-22 years old that used hand sanitizer during COVID-19 pandemic. Exclusion criteria in this research is anyone that has other skin diseases, such as allergic contact dermatitis, seborrheic dermatitis, lichen planus, or viral/fungi infections. Choosing of sample is conducted through purposive sampling method. The amount of sample used are 260 subjects. Independent variable of this research is hand sanitizer usage frequency, whereas the dependent variable is the incidence of ICD.

The process of data taking started from giving an explanation through letter of information, asking the permission from subject through informed consent procedure, filling in the questionnaire, and conducting physical inspection by sending photo of skin lesion due to ICD for research purposes. Photo of skin lesion would then be inspected by dermatovenereologist. Data that had been obtained were analyzed using chi-square test in SPSS-26 application. Hypothesis test is claimed to have significant difference if $p < 0.05$ with confidence interval of 95%, while insignificant difference is claimed when $p > 0.05$.

RESULTS

Characteristics obtained from 260 research subjects are analyzed through univariate test with the result presented in frequency and percentage table.

Table 1. Characteristics of Research Subjects

Variable	n	%
Age (years)		
18	9	3,5
19	36	13,8
20	119	45,8
21	89	34,2
22	7	2,7
Hand sanitizer usage frequency (daily)		
<5x	80	30,8
5-10x	147	56,5
>10x	33	12,7
Duration of scrubbing (seconds)		
<10	132	50,8
10-20	112	43,1
>20	16	6,2
Usage of hand moisturizer		
Yes	41	15,8
No	219	84,2
History of skin irritation		
Yes	17	6,5
No	243	93,5

Most of the subjects are at the age of 20 years old, specifically 119 students (45.8%). 147 subjects (56.5%) use hand sanitizer 5-10 times a day, 132 subjects (50.8%) scrub their hands <10 seconds, 41 subjects (15.8%) use hand moisturizer after using hand sanitizer, and 17 subjects (6.5%) has a history of skin irritation before COVID-19 occurs.

Table 2. Incidence of Irritant Contact Dermatitis

Incidence of ICD	F	%
Yes	87	33,5
No	173	66,5
Total	260	100

ICD is diagnosed through symptoms, such as erythema, edema, vesicles, papules, pustules, crusts, desquamations, or lichenification, and skin lesion photo examined by a dermatovenereologist. Based on the study conducted, 87 subject (33.5%) has ICD due to hand sanitizer usage during COVID-19



pandemic. Symptoms reported are dry and scaly skin (30%), itchiness (14.2%), redness of skin (9.2%), stinging (9.2%), hot and burning sensation (9.2%), blisters that omits liquid when peeled (6.9%), other blisters forming due to healthy skin contact with liquid from previous blisters (7.3%), wound forming when blisters peeled (6.9%), skin cracks (6.9%), pain (6.5%), skin thickening (4.2%), and swollen skin (3.1%).

Table 3. Data Analysis Result of the Relation between Hand Sanitizer Usage Frequency and the Incidence of ICD using Chi-Square Test

Hand sanitizer usage frequency (daily)	Incidence of ICD		Total	p
	Yes	No		
<5x	34	46	80	0,078
5-10x	41	106	147	
>10x	12	21	33	
Total	87	173	260	

Based on the table above, data analysis of the relation between hand sanitizer usage frequency and the incidence of ICD using chi-square test results in $p=0.078$. This means that there is no significant relationship between hand sanitizer usage frequency and the incidence of ICD during COVID-19 pandemic.

DISCUSSION

This study is aimed to find the relation between hand sanitizer usage frequency and the incidence of ICD during COVID-19 pandemic in Faculty of Medicine, Diponegoro University students. Based on the analysis conducted in this research, it is found that there is no significant relationship between hand sanitizer usage frequency and the incidence of ICD during COVID-19 pandemic ($p=0.078$). This result is in line with a study conducted by Salim Rifat which concludes that there is no significant relationship between hand sanitizer usage frequency and contact dermatitis incidence in Faculty of Medicine, Tadulako University students, where the independent and dependent variables are the same as this research.¹⁶ On the contrary, a different result is obtained by Quenan S, et al, where it is found that hand sanitizer usage frequency has a significant relationship with the incidence of ICD because of

the alcohol found in hand sanitizers which contributes to the incidence of ICD.¹⁷ This difference may be caused by the method used by Quenan S, et al, which is cohort study on medical staffs.¹⁷

Irritant contact dermatitis is influenced by endogenous factors, such as age, genetics, sex, and history of atopic dermatitis as well as exogenous factors, which are contact with irritant agents, mechanic factors, and climate conditions.¹⁸ Irritant agents may cause a wide range of skin damage, from lipid layer structure damage, edema, to protein denaturation on stratum corneum which in turn may damage the skin deeper up to the dermal layer.⁸ The most important characteristic of skin barrier is TEWL, which is to maintain skin hydration in order to prevent irritation.⁷ Inflammation response may occur due to epidermal damage that activates inflammatory cells which cause ICD symptoms.⁹

Hand sanitizer is one of the hand hygiene products that inhibits and inactivates microorganism growth.¹⁹ Hand sanitizer is divided into two categories, which are alcohol-based hand sanitizer (ABHS) and alcohol-free hand sanitizer (AFHS).¹³ World Health Organization (WHO) recommends the use of ABHS due to its proven capability to inactivate virus.¹⁵ ABHS contains ethanol, an irritant, that may damage the skin by breaking protein into primary structures in stratum corneum, changing the intercellular lipid layer, decreasing the ability of corneocyte cells to be attached, and increasing TEWL, which will create ICD symptoms.¹⁵

The hypothesis that there could be a relationship between hand sanitizer usage frequency and the incidence of ICD during COVID-19 pandemic is found to be unproven. Other factors that may affect this research is a difference in alcohol concentration on each hand sanitizer used by subjects, duration of hand scrubbing when using hand sanitizer, habits of using hand moisturizer after using hand sanitizer, and history of skin irritation (atopic dermatitis or eczema) before COVID-19 pandemic.

Results of the study shows that incidence of ICD is higher on hand sanitizer usage frequency of <5 times per day (42.5%), compared then 5-10 times a day (27.9%) and >10 times a day (36.4%). This could be caused due to other factors that may affect the research, such as the usage of hand moisturizer



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after using hand sanitizer (15.8%). Usage of hand sanitizer is less frequent on subjects with hand sanitizer usage frequency of <5 times a day (19.5%), compared to 5-10 times a day (65.9%) and >10 times a day (14.6%), which makes ICD occurs more on those that use hand sanitizer <5 times a day. In theory, hand moisturizer is an emulsifier that can hydrate the skin and reduce TEWL process, which makes the skin less easily irritated.²⁰

History of atopic dermatitis is also a risk factor in ICD, where individuals that have a history of atopic dermatitis have a relatively dry skin and easily irritated by irritant agents.²¹ 17 subjects (6.5%) has a history of atopic dermatitis before COVID-19 pandemic. Subjects with hand sanitizer usage frequency of <5 times a day (82.4%) has a more frequent history of atopic dermatitis when compared to 5-10 times a day (11.8%) and >10 times (5.9%). Subjects with history of atopic dermatitis has a lower excitatory threshold towards irritant which makes them easily irritated by irritants such as hand sanitizer.² This may cause the insignificant result obtained.

This research is not without limitations. The diagnosis taken from symptoms evaluation of the subjects using questionnaire is less specific. Objective symptoms such as erythema, edema, vesicles, pustules, and crusts indicates ICD, while subjective symptoms such as burning sensation, pain, and itching indicates not suffering from ICD. Physical examination were only conducted through photographs of skin lesion with ICD indication instead of direct examination due to pandemic demand of online activities. Moreover, cross-sectional research that only measures subject in one set of duration and subjects exclusively from Faculty of Medicine, Diponegoro University students limits the study, where ideally, a bigger set of subjects outside of those students and the age listed should be included.

CONCLUSION

Hand sanitizer usage frequency do not have a significant relationship with the incidence of irritant contact dermatitis during COVID-19 pandemic on students of Faculty of Medicine, Diponegoro University. Most hand sanitizer usage frequency found in research subjects is 5-10 times a day (56.5%). Most frequent symptoms of ICD found in research subjects is dry, scaly, and peeling skin

(30%). The incidence of ICD due to hand sanitizer usage during COVID-19 pandemic in students of Faculty of Medicine, Diponegoro University is 33.5%.

ETHICAL CLEARANCE

All research procedures have obeyed research ethics as stated in the terms of ethical clearance from Health Research Ethics Committee of Faculty of Medicine of Diponegoro University. Certificate of ethical clearance issued by the committee is No. 191/EC/KEPK/FK-UNDIP/VI/2021.

CONFLICT OF INTEREST

There is no conflict of interest related to the materials, methods, and findings in this study.

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