

## THE EFFECTS OF HANDWASHING HABITS ON HEALTH PROTOCOLS ON SKIN HYDRATION LEVELS AND INCIDENCE OF IRRITANT CONTACT DERMATITIS

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### ABSTRACT

**Background:** Handwashing using soap or hand sanitizer is one of the health protocols that must be implemented by society to prevent the spreading of SARS-COV2 virus which can cause pneumonia, acute respiratory syndrome and death. The implementation of health protocols during the COVID-19 pandemic caused the habit of handwashing increase. Hence, it can lead to cause irritant contact dermatitis and dry hand skin due to frequent contact with soap or hand sanitizers. **Method:** This study is an observational study with the sample from the villager of Banyumas regency. The data collection was taken by cluster random sampling and accidental sampling. **Results:** Considering the health protocol, most of the villager used to wash their hands regularly and 3 respondents (3.00%) of them did not. 100 respondents took the data and 19 respondents (19.00%) have irritant contact dermatitis and the rest did not. Furthermore, for skin hydration levels with dehydration category (0% - 29%) are 50 respondents (50.00%), normal category (30% - 50%) are 38 respondents (38.00%) and hydration category (51% - 100 %) are 12 respondents (12.00%). Chi-Square analysis showed that there was no significant relationship between handwashing habit and the incidence of irritant contact dermatitis with the value of "P" is 0.394 > 0.05 and there was a significant relationship between hand washing habits and skin hydration levels with the value of "P" is 0.010 < 0, 05. **Conclusion:** Handwashing habits have a significant relationship to skin hydration levels.

**Keywords:** Handwashing, health protocols, irritant contact dermatitis, skin hydration.

### 1. INTRODUCTION

In early December 2019, a new type of virus was discovered in Wuhan, China, which is named Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-COV2). This virus can attack the respiratory system causing Coronavirus Disease-2019 (COVID-19) and in severe cases can cause pneumonia, acute respiratory syndrome and even death (Sun, 2020). The spread of the SARS-COV2 virus took place very quickly and almost no country in the world could prevent the outbreak, so that on March 11<sup>th</sup>, 2020, the World Health Organization (WHO) declared the SARS-COV2 virus as a pandemic (Mona, 2020).

Indonesia is one of the countries infected with the SARS-COV2 virus with 228,993 positive patients by September 17, 2020 and is expected to continue to grow every day (WHO, 2020). Therefore, the Indonesian government calls on the public to apply a lifestyle in accordance with health protocols to prevent the spread of the SARS-COV2 virus.

Washing hands using soap or hand sanitizer is one of the health protocols that people must implement in their daily lives. This is considered to be the most effective and important step to take because vaccines and specific drugs to prevent or treat COVID-19 infection have not been found. It is undeniable that during the COVID-19 pandemic, the habit of washing hands is increasing than usual, but this can cause new problems in the community such as the incidence of irritant contact dermatitis due to repeated contact with irritants which is marked by thickening of the skin, cracks, pain, heat, dry, swollen and itchy skin and skin like scaling (R Mariz *et al.*, 2014).

During the COVID-19 pandemic, the frequency of washing the hands of health workers increased by 99.26% and 88.6% of them experienced irritant contact dermatitis with symptoms

of dry skin on the hands (Kiely *et al.*, 2020). Wicaksono and Ummu's research in 2020 shows that respondents who wash their hands using a hand sanitizer > 20 times / day experience skin irritation and damage to the fingers, while respondents who wash their hands using soap 10-20 times / day experience dry skin on the hands.

Based on that description, the researchers were interested in conducting research related to the effects of hand washing habits on health protocols on skin hydration levels and the incidence of irritant contact dermatitis, and the research was conducted in Banyumas Regency as one of the areas affected by COVID-19 that applies the health protocol.

## 2. METHODS

This research is a descriptive analytic study with observational study and cross-sectional design to see the relationship between independent variables and the dependent variables at the same time. The population in this study were the people of Banyumas Regency, and the sample was determined using the Cluster Random Sampling technique, and the sample were Banyumas, Jatilawang, Cilongok and North Purwokerto Districts. Meanwhile, for data collection, the Accidental Sample technique was used, namely data from respondents who happened to be in the research location at the same time when the researcher was collecting data and were selected based on the inclusion and exclusion criteria set by the researcher.

The measuring instrument used in this study was the Skin Analyzer Tester that was used to measure skin hydration levels, and a questionnaire that was used to determine the characteristics of respondents, hand washing habits and skin complaints or the incidence of irritant contact dermatitis experienced by respondents after washing their hands on the application of health protocols.

The research was conducted by visiting public places such as markets, town square, parks and others in accordance with a predetermined area. Then the researchers looked for respondents who matched the inclusion criteria, and were willing to become respondents by signing an informed consent sheet. After that, the researcher gave a questionnaire and measured the hydration level of the skin on the palms of the hands and the backs of the respondent's right-left hands.

Univariate analysis was implemented to obtain the results which describe the characteristics of each research variable in the form of a frequency table, then bivariate analysis was carried out using the Chi-Square test to see the relationship between the independent variable and the dependent variable and multivariate analysis to determine the effect between 2 or more variables. In this study, multivariate analysis of multinomial logistic regression test was used to see the effect of hand washing habits on skin hydration levels and a simple logistic regression test to see the effect of hand washing habits on the incidence of irritant contact dermatitis.

## 3. RESULTS AND DISCUSSION

Data from the Banyumas Regency area which were taken from Jatilawang District, North Purwokerto District, Banyumas District and Cilongok District resulted 100 respondent data that can be used in the study.

### Univariate Analysis

From the results of the study, the data obtained related to characteristics of the respondents included age, gender and disease history were as follows [Table 1](#).

[Table 1](#). Respondents' Characteristics

Characte- ristics	North Purwo -kerto	Banyu -mas (n=16)	Jatila- wang (n=31)	Cilongok (n=24)	Total (n=100)	P Value Incidence	P Value Skin
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	(n=29)					of Irritant Contact Dermatitis	Hydration Level
<b>Age</b>							
≥ 18	14 (48.27%)	14 (87.5%)	19 (61.29%)	20 (83.33%)	67 (67.00%)	0.218	0.001
≥ 40	15 (51.72%)	2 (12.5%)	12 (38.71%)	4 (16.67%)	33 (33.00%)		
<b>Gender</b>							
Men	10 (34.48%)	2 (12.5%)	4 (12.90%)	6 (25.00%)	22 (22.00%)	0.083	0.408
Women	19 (65.52%)	14 (87.5%)	27 (87.10%)	18 (75.00%)	78 (78.00%)		
<b>Case History</b>							
With case history	0 (0%)	0 (0%)	3 (9.68%)	2 (8.33%)	5 (5.00%)	0.017	0.387
Without case history	29 (100%)	16 (100%)	28 (90.32%)	22 (91.67%)	95 (95.00%)		

The results of the characteristics of the respondents obtained included socio-demographic data based on the age of the respondents, dominated by 67 people  $\geq 18$  years old (67.00 %) and 33 people  $\geq 40$  years old (33.00%) with p value results on the incidence of irritant contact dermatitis is  $0.218 > 0.05$ , while the p value for skin hydration levels is  $0.001 < 0.05$ , so it can be concluded that age only has a significant relationship with skin hydration levels. It was in line with the research of [Luebberding et al., \(2013\)](#) which states that the hydration of the *stratum corneum* of men and women will decrease along with the increasing of age starting at the age of 40. In old age, the skin tends to become dry due to skin physiological changes which cause a significant reduction in natural moisturizing factor (NMF) levels ([Bianti, 2016](#)).

Characteristics of respondents based on gender were dominated by female gender as many as 78 respondents (78.00 %) and male as many as 22 respondents (22.00%) with a p value for the incidence of irritant contact dermatitis of  $0.083 > 0.05$  while the p value to the skin hydration level of  $0.408 > 0.05$ , so it can be concluded that gender does not have a significant relationship with the incidence of irritant contact dermatitis and skin hydration levels in this study. This was due to the fact that the number of respondents with the gender of women was far more than the number of respondents with the gender of men so that it did not represent the ratio of each gender.

Characteristics of respondents based on their case history shows that most of the respondents did not have a case history of disease as many as 95 respondents (95.00%) and the remaining 5 respondents (5.00%) had a history of disease with a p value for the incidence of irritant contact dermatitis of  $0.017 < 0.05$ , while the p value for skin hydration levels was  $0.387 > 0.05$ , so it can be concluded that case history has a significant relationship with the incidence of irritant contact dermatitis in this study. This result is supported by research by [Retnoningsih \(2017\)](#) which states that there is a significant relationship between a history of skin disease and the incidence of contact dermatitis in fishermen ( $p = 0.000$ ) so that previous case history of disease can affect the occurrence of contact dermatitis. Having a history of skin disease will increase the susceptibility to dermatitis due to a decrease in the threshold which damaged the skin barrier. When there is inflammation, chemicals will easily irritate the skin, so that the skin is prone to dermatitis.

Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-COV2) is a virus that has a lipid membrane resembling a double-layered micelle with 2 hydrophobic tail bands that are sandwiched between 2 hydrophilic rings, the membrane is full of proteins that keep the virus alive and able to infect. SARS-COV2 tends to be more sensitive to the disinfection process than other types of viruses so that it is easily removed by hand washing, where soap can dissolve the fat membrane in the virus (Nopriyati *et al.*, 2020).

Soap with the addition of surfactants such as *sodium lauryl sulfate* (SLS) will be irritant to the skin which can cause loss of natural oil and dry skin, as well as soap with *triclosan* as the active ingredient which can kill the normal flora of the skin or the protective layer of the skin when it is used excessively. The use of hand sanitizers containing 60-90% alcohol can cause the skin to become dry and irritated if used excessively, this is because alcohol is an organic solvent that is flammable so that it can dissolve the layer of fat and sebum on the skin. Therefore, to avoid dry skin after using soap or hand sanitizer, use the soap or hand sanitizer that is not excessive, and apply a moisturizer after using soap or hand sanitizer to increase skin hydration levels and repair the *stratum corneum* (Damayanti, 2017).

Table 2. Handwashing Habits

Handwashing Habits	N (100%)
not use to wash hand	3 (3%)
use to wash hand	97 (97%)
Total	100 (100%)

Table 3. Skin Hydration Level

Skin Hydration Level	N (100%)
Dehydrated (0% - 29%)	50 (50%)
Normal (30% - 50%)	38 (38%)
Hydrated (51 - 100%)	12 (12%)
Total	100 (100%)

Table 4. Incidence of Irritant Contact Dermatitis

Incidence of Irritant Contact Dermatitis	N (100%)
Negative	81 (81%)
Positive	19 (19%)
Total	100 (100%)

Based on Table 2, it can be seen that most of the respondents used to wash their hands during the implementation of the health protocol, namely 97 respondents (97.00 %) and there were 3 respondents (3.00%) who did not usually wash their hands during the implementation of the health protocol. However, if it is seen from the answers of the respondents in filling out the questionnaire, it can be seen that although respondents used to wash their hands according to the implementation of health protocols, there are still many respondents who do not carry and use hand sanitizers when traveling. In addition, when washing their hands, most respondents always wash their hands using soap and running water, and rarely wash their hands using a hand sanitizer. This is because respondents are used to and feel cleaner when washing their hands using soap and running water compared to hand sanitizers. Most respondents rarely wash their hands for more than 40 seconds which is not proper.

Based on Table 3, it is known that most of the respondents have skin hydration levels of 0% - 29% or dehydrated. Meanwhile from Table 4, it can be seen that most of the respondents in the Banyumas Regency area do not experience irritant contact dermatitis. The skin can become dehydrated if the skin is repeatedly in contact with irritants that causes lipid erosion in

the *stratum corneum*, thereby increasing TEWL and allowing irritants to enter the epidermis which induces the release of pro-inflammatory cytokines by keratinocytes (interleukin-1 $\alpha$ , interleukin-1 $\beta$ , interleukin-6 and tumor necrosis factor- $\alpha$ ) which causes irritant contact dermatitis (Chaerunnisa *et al.*, 2020).

### Bivariate Analysis

**Table 5.** Relationship Between Hand Washing Habits and Skin Hydration Levels

		Skin Hydration Level			Total (n=100)	P Value
		Dehydrated (0% – 29%)	Normal (30%–50%)	Hydrated (51% – 100%)		
Hand washing habits	Not use to wash hand	0 (0%)	1 (1%)	2 (2%)	3 (3%)	0,010
	Use to wash hand	50 (50%)	37 (37%)	10 (10%)	97 (97%)	

Based on [Table 5](#), the result of the Chi-Square analysis shows that the p value between hand washing habits and skin hydration levels is  $0.010 < 0,05$ . The result of this study indicates that there is a significant relationship between the habit of washing hands and the level of skin hydration in the community in the Banyumas Regency area. The result of this study is supported by research conducted by [Chairunnisa \*et al.\*, \(2020\)](#) which states that frequent exposure to soap and water can cause damage to the *stratum corneum* which can increase TEWL and decrease skin hydration levels.

**Table 6.** The Relationship between Hand Washing Habits and the Incidence of Irritant Contact Dermatitis

			Incidence of Irritant Contact Dermatitis		Total (n=100)	P Value
			Negative	Positive		
Hand washing habits	Not use to wash hand	3 (3%)	0 (0%)	3 (3%)	0,394	
	Use to wash hand	78 (78%)	19 (19%)	97 (97%)		

Based on [Table 6](#), the result of the chi-square analysis shows that the p value between the habit of washing hands and the incidence of irritant contact dermatitis is  $0.394 > 0.05$ . The results of this study indicate that there is no significant relationship between the habit of washing hands with the incidence of irritant contact dermatitis in the community in the Banyumas Regency area. The result of this study is supported by research by [Wolfe \*et al.\*, \(2016\)](#) which shows that there is no relationship between hand's hygiene in preventing Ebola transmission with the incidence of dermatitis with a p value of  $0.824 > 0.05$ , but it was found that washing hands more often can cause irritation of the skin, especially redness (erythema). This is probably due to individual factors possessed by respondents such as skin thickness and skin sensitivity to irritants, where the thicker the skin and the lower sensitivity of the skin to irritants, the more difficult it will be for the irritant material to penetrate the stratum corneum layer and cause skin damage. In addition, with the development of soap and hand sanitizer products, humectants are added to their manufacture to minimize the side effects caused by repeated use of soap and hand sanitizers such as dry skin, causing irritant contact dermatitis in some people.

## Multivariate Analysis

Table 7. The Effect of Hand Washing Habits on Skin Hydration Levels

Skin Hydration Level	Sig.	Exp (B)	95% C.I for EXP (B)	
			Lower	Upper
Dehydrated	Intercept	0.000		
	Hand washing habits	, 60103104.19	60103104.19	60103104.19
Normal	Intercept	0.571		
	Hand washing habits	0.117	7.400	0.607 90.153

Table 8. The Effects of Handwashing Habits on the Incidence of Irritant Contact Dermatitis

		Incidence of Irritant Contact Dermatitis		Total (n=100)	P Value
		Negative	Positive		
Hand washing habits	Not use to wash hand	3 (3%)	0 (0%)	3 (3%)	0.394
	Use to wash hand	78 (78%)	19 (19%)	97 (97%)	

Based on Table 7, the result of the adjusted OR or exp (B) value is 60103104.19 with a p value <0.05, so it can be interpreted that people in the Banyumas Regency area with the habit of washing hands as the implementation health protocol have the possibility of 60103104.19 times experiencing skin hydration levels, dehydration category. Whereas in Table 8, the adjusted OR or exp (B) value of the hand washing habit variable on the incidence of irritant contact dermatitis is 393513027.4 with a p value of 0.999 > 0.05, so it means that the habit of washing hands has no effect on the incidence of irritant contact dermatitis in respondents.

The result of this study is not in line with the research conducted by Guertler *et al.*, (2020) which showed that the increasing frequency of washing hands during the COVID-19 pandemic caused the incidence of acute hand dermatitis experienced by 90.4% of health workers, with dry skin (83.2%) being the most frequent symptom, followed by erythema, itching, burning, scaling, fissure and pain. Likewise, in a study by Alsaidan *et al.*, (2020) which showed that an increase in the habit of washing hands during the COVID-19 pandemic caused 34.8% (821 study individuals) to experience changes or symptoms of skin disease during the COVID-19 pandemic, 83,2% of whom experienced symptoms of dryness of the skin, 54.2% experienced changes in skin texture, then experienced itching, skin discoloration, redness, and pain/burning caused by excessive use of soap/cleanser for hand hygiene, causing *xerosis* and disorder function of skin protection which over time can cause contact dermatitis.

## 4. CONCLUSION

The description of the habit of washing hands that is included in the health protocol implementation in the Banyumas Regency area: most of the respondents used to wash their hands during the implementation of the health protocol, but there are still many respondents who do not carry and use hand sanitizers when traveling. In addition, most respondents always wash their hands using soap and running water, they rarely use hand sanitizers, they rarely wash their hands properly and properly, and they rarely wash their hands for more than 40 seconds. This study found out that the habit of washing hands in the implementation of health protocols

has an effect on skin hydration levels and does not affect the incidence of irritant contact dermatitis.

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