

# Epidemiology of Occupational Contact Dermatitis (OCD) on health workers in Covid-19

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## Abstract

**Background** Generally, the diagnosis of OCD can be considered after a history of exposure to the suspected material and a thorough physical examination. Meanwhile, vital information about it is often overlooked during the initial consultation.

**Objective** Evaluating the epidemiological profile of OCD cases in health workers due to the COVID-19 pandemic and evaluating complaints, manifestations and causative materials of OCD cases in health workers at the isolation ward of Dr. Soetomo Surabaya Hospital during the Covid-19 pandemic.

**Methods** Purposive sampling was used to design research samples from accessible populations that matched the inclusion requirements while those who met exclusion criteria were included as research samples.

**Results** Majority OCD patients are women and the most common age range is between 22-35 years old. The occupation most affected by OCD while working at isolation ward during the pandemic is nurses. The most common complaint is itching followed by redness of the skin which appears most frequently on the hands. The most prominent clinical manifestations are desquamation followed by erythema-like skin lesions. Medical gloves are the sort of personal protection equipment that causes OCD the most, followed by hand hygiene activities. High risk factors for OCD include a family history of atopic illnesses, history of asthma and an early history of atopic dermatitis.

**Conclusion** The use of PPE can cause several effects on the skin such as physical trauma to the skin, acne, contact dermatitis, urticaria, and aggravate previous skin diseases. The most common skin disorders are erythema, papules, scales, fissures, erosions, ulcers, vesicles and wheals. Complaints of contact dermatitis can be reduced and prevented by taking preventive measures in the form of using moisturizers on areas that are often exposed.

### Key words

Cellulite, collagen septae, cosmeceuticals, radiofrequency, subscision, laser, extracorporeal shockwave therapy, dermal filler, carboxytherapy.

## Introduction

Contact dermatitis is inflammation in the form of itchy red rash on the skin with spongiosis or intercellular edema of the epidermis due to the interaction of irritants or external allergens with the skin.<sup>1</sup> The Canadian Center for Occupational

Health (CCOHS) in 2016 stated that Occupational Contact Dermatitis (hereinafter referred to as OCD) is a skin condition caused by work-related exposures. Skin inflammation that occurs in OCD, can be caused by allergens or irritants that come into direct contact with the skin, originating from the workplace.<sup>2</sup> Due to the

Coronavirus Disease 2019 (COVID-19) pandemic, as an effort to prevent transmission to health workers who treat patients with Covid-19 infection, the use of hand sanitizers, frequent hand washing and the use of personal protective equipment (PPE), including the use of masks, goggles, face shield, hazmat, closed shoes and shoe covers. The use of PPE turned out to cause several skin health problems experienced by health workers who work as the frontline prevention of Covid-19 infection as experienced by health workers in China.<sup>3</sup> So far, no epidemiological data are available on OCD in health workers due to the use of PPE and an assessment of the quality of life of health workers who experience OCD due to the use of PPE during the Covid-19 pandemic in Surabaya.

Epidemiological studies in Australia in 2012 showed that contact dermatitis accounts for 79-95% of all occupational skin diseases, 44% is irritant contact dermatitis (ICD) and 32.7% is allergic contact dermatitis (ACD).<sup>4</sup> As highlighted by Koch P., the incidence of OCD is estimated by 0.5–1.9 cases/1000 workers/year.<sup>5</sup> Epidemiological data from previous research conducted in China in 2020, the prevalence of skin damage in health workers related to preventive measures against COVID-19 infection through the use of PPE was reported to be 97.0% (526 out of 542) and the most frequently affected location was the bridge of the nose (83.1%), cheeks (78.7%), hands (74.5%), and forehead (57.2%).<sup>3</sup> Another study in Wuhan with 1000 surveys conducted on health workers who had to wear PPE, reported

having an adverse skin reaction during the COVID-19 pandemic with the three most frequently affected areas such as hands (84.6%), cheeks (75.4%) and the bridge of the nose (71.8%).<sup>6</sup> Contact dermatitis accounts for 70-90% of all occupational skin diseases and can negatively affect quality of life. Contact dermatitis on the hands of healthcare workers is common and can lead to decreased quality of life, absenteeism from work and even unemployment. Education of hospital health workers is important to increase awareness and understanding of contact dermatitis.<sup>7</sup>

The use of PPE by health workers in the long term will increase the risk of OCD.<sup>8</sup> Several other factors that affect OCD in health workers include varying physical, chemical, and biological exposures in the work environment, which can increase the risk and worsen the condition of contact dermatitis in the workplace. These include workplace exposures that cause skin to become wet (e.g., frequent hand washing and wearing of gloves), exposure to chemicals in the work environment (e.g., methacrylate agents, cleaning agents, accelerators in rubber gloves), and microbial exposure (e.g., methicillin resistant *Staphylococcus aureus*). Health workers with a history of psoriasis or eczema are more likely to experience OCD. Women who handle their own household chores at home, have a higher OCD incidence. In fact, health workers are dominated by women, which is a risk factor for increasing OCD in medical workers.

Generally, the diagnosis of OCD can be considered after a history of exposure to the suspected material and a thorough physical examination. Meanwhile, vital information about it is often overlooked during the initial consultation. Mathias proposes seven objective criteria that form a framework for correct identification for diagnosing OCD. If there are 4

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of the 7 criteria, it can be concluded that the dermatitis may come from work.<sup>9</sup>

The impact of the occurrence of OCD either directly or indirectly can affect the necessary treatment and is associated with the loss of working time and reduce worker productivity so that it can affect the quality of life, this is shown from the results of the research value  $p=0.006$  ( $p<0.05$ ) the relationship between the two variables.<sup>10</sup> Skin health problems caused by OCD can affect the quality of life of health workers and their families. The effects can be serious for relatives or other family members, especially when it comes to raising children. The secondary effects of quality of life on nuclear family members can have a serious impact on the emotional, health, social and financial aspects of their lives.<sup>8</sup>

The following measures can be taken to prevent OCD caused by PPE: Before using a mask, one should wash face gently, especially on the forehead, bridge of the nose, cheeks, under the chin, and behind the earlobe. Apply a thin layer of noncomedogenic moisturizer all over the face. This item will serve as a barrier between the mask and the skin. Apply a face-specific antiperspirant if the skin is prone to excessive moisture or perspiration. Allergic reactions to mask ingredients may occur. A strip of glue or rubber down the nose or a metal wire are the most prevalent allergies. Generally, wire is made of nickel, which is one of the allergen materials, hence it can be coated with hydrogel dressings, bandages, or foam material to prevent OCD.<sup>11</sup> Moisturizer with petroleum jelly content can be used after washing hands which is useful for coating the surface of the skin to prevent water loss due to washing hands too often by the use of disinfectant.<sup>12</sup>

This study aims to evaluate the epidemiological profile of OCD cases in health workers due to

the COVID-19 pandemic, evaluate complaints, manifestations and ingredients that cause OCD cases in healthcare workers especially in the Dr. Soetomo Surabaya Hospital Isolation Ward during the covid-19 pandemic. This research has been reviewed and approved by the Ethics Committee at Dr. Soetomo General Academic Hospital Surabaya (0160/KEPK/III/2021).

## **Literature review**

### ***Contact Dermatitis***

Contact dermatitis is a form of inflammation of the skin with spongiosis or intercellular edema of the epidermis due to the interaction of irritants or external allergens with the skin.<sup>1</sup> Contact dermatitis is divided into two based on the cause, namely irritant contact dermatitis (ICD) and allergic contact dermatitis (ACD). ICD is caused by chemical irritants and ACD is caused by antigens or allergens. ACD is a type IV hypersensitivity reaction which is cell-mediated or delayed type. Because ICD is toxic, the inflammatory reaction is only limited to the area of exposure, the boundaries are firm and never spread, while ACD is an immune reaction that tends to involve the surrounding skin or a spreading phenomenon and can even spread beyond the affected area. There may also be a generalized spread of ACD.<sup>2</sup> OCD is skin inflammation caused by the work environment. Skin interactions that come into contact with materials/substances in the work environment can trigger OCD in the form of irritant or allergic contact dermatitis.<sup>13</sup>

### **Epidemiology of occupational contact dermatitis**

CCOHS in 2016 stated that if the skin inflammation caused by allergens or irritants in direct contact with the skin comes from the workplace, then it is OCD. The results of

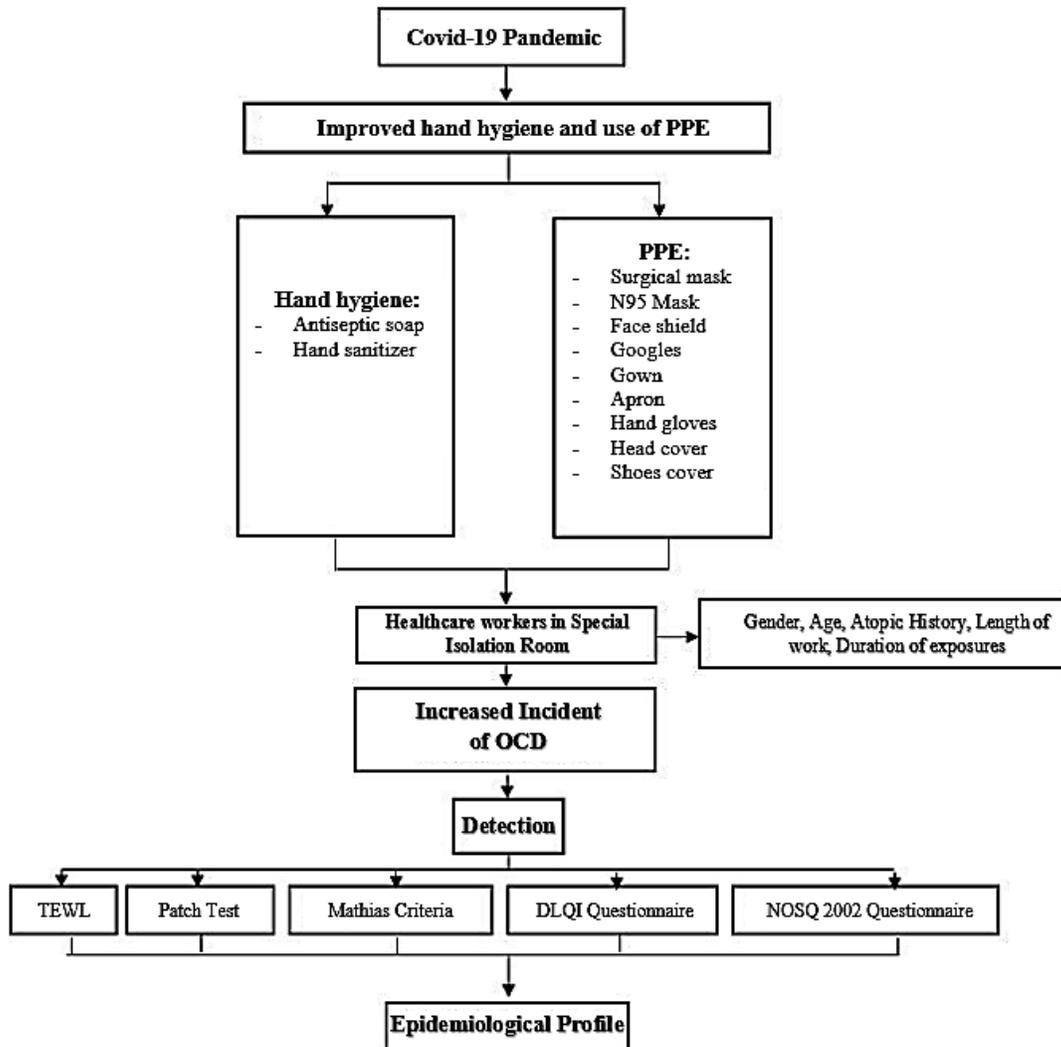


Table 1 Conceptual framework.

epidemiological studies show the incidence of OCD is 0.5–1.9 cases/1000 workers each year.<sup>14</sup> The prevalence of skin damage for health workers related to the prevention of COVID-19 infection through the use of PPE is reported to be 97.0% (526 out of 542). Research in China reports that 74.5% of medical personnel on the front lines of COVID-19 have experienced OCD since the start of the pandemic. Meanwhile, a survey in the United States showed that 55% of inpatient hospital nurses experienced OCD.<sup>15</sup> The agent that most often triggers the occurrence of OCD is water. A wet or humid work environment and contact with water or water

mixed with detergents can trigger irritant dermatitis leading to allergic contact dermatitis and atopic dermatitis due to hard to avoid.<sup>16</sup>

During the current COVID-19 pandemic, cases of contact dermatitis appeared among health workers, especially those working in Isolation ward (RIK). Contact dermatitis itself arises due to the presence of certain causative agents and other predisposing factors, such as gender, age, atopic history, TEWL, length of work, length of exposure, use of PPE and washing hands repeatedly using soap or hand sanitizer. OCD is diagnosed through Mathias criteria, work-related

skin disorders can be ICD or ACD. The appearance of contact dermatitis is also accompanied by complaints, clinical manifestations and an epidemiological profile (Table 1).

**Hypothesis**

There is a relationship between the variables of sex age, length of exposure, length of work, gender, history of atopic, TEWL, hand hygiene, use of personal protective equipment such as surgical/facemask, N95 mask, face shield, goggles, gown, apron, gloves, protective gear head, protective shoes, against the occurrence of OCD in health workers.

There is a suitability of the patch test between the materials contained in the hand sanitizer, antiseptic soap, surgical/ facemask, N95 mask, face shield, goggles, gown, apron, gloves, head protection, protective shoes, against the occurrence of OCD in health workers.

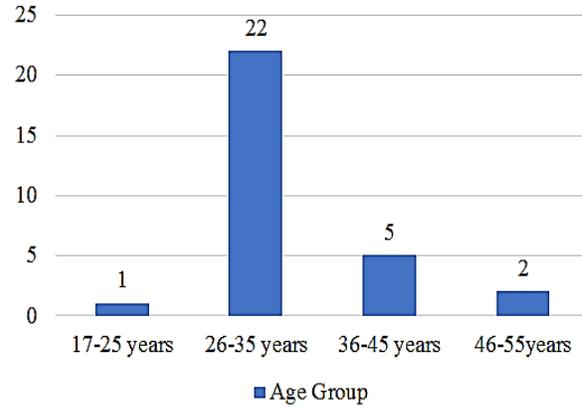
**Research methods**

Purposive sampling was used to determine the sample, which consisted of an accessible population that matched the inclusion requirements and had no exclusion criteria. The target population consists of healthcare professionals working in the Isolation ward at Dr. Soetomo Surabaya Hospital. The accessible population is health workers who carry out hand hygiene activities and use PPE at Isolation ward of Dr. Soetomo Surabaya Hospital.

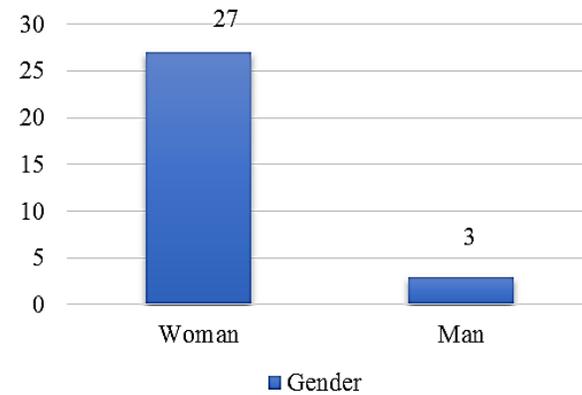
**Analysis Results and Discussion**

**Evaluation of Epidemiological Profile of OCD Cases in Health Workers at Dr. Soetomo Surabaya in Isolation Ward During the COVID-19 Pandemic**

Based on Figure 1 above, the distribution of the age frequency with age classification based on

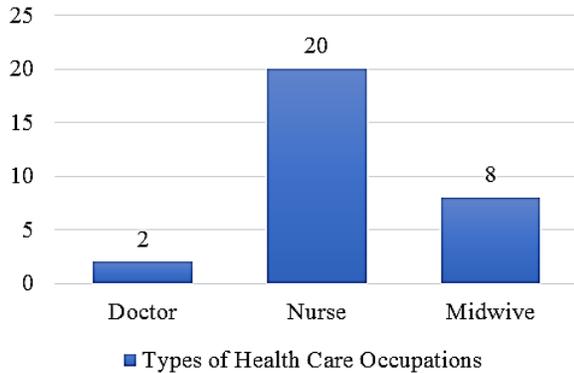


**Figure 1** Distribution of age groups of health workers who experience occupational contact dermatitis (OCD).

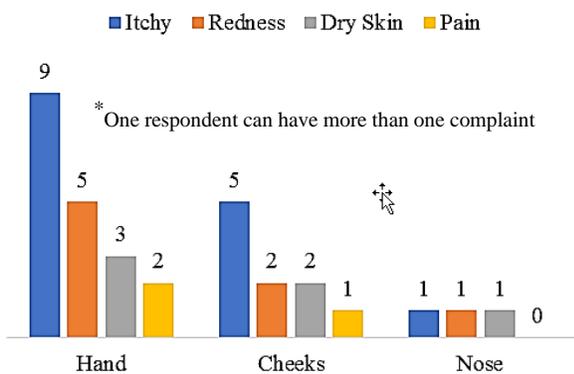


**Figure 2** Distribution of Gender on health workers with OCD.

physical conditions can be identified. The age classification according to the Ministry of Health with details: toddlerhood 0-5 years, early childhood 5-11 years, early adolescence 12-16 years, late adolescence 17-25 years, adults early age is 26-35 years, late adulthood is 36-45 years, early elderly is 46-55 years, late elderly is 56-65 years, and the elderly is >65 years. According to Kosasih, the elderly group are individuals who are helpless and not independent, so they always need care from others.<sup>17</sup> Based on the table above, the distribution of respondents with OCD cases based on age is the most in the age group 26-35 years (early adulthood) 22 respondents (73%), age 36-45 years (late adulthood) 5 respondents (17%), age 46-55 years old (early elderly) 2 respondents (7%), and 17-25 years old (late teens) with only 1 respondent (3%).



**Figure 3** Distribution of health workers with OCD by the types of occupations.



**Figure 4** Distribution of complaints by health workers who experience OCD.

Based on **Figure 2** above, distribution of respondents by gender consisted of 27 people (90%) are woman and 3 people (10%) are man.

Based on **Figure 3** above, it describes the distribution of respondents based on the occupation of health personnel who experience OCD. There is as many as 20 respondents (60%) are nurses, followed by 8 respondents (26%) are midwives, and 2 respondents (6%) are doctors.

Based on **Figure 4** above, it can be seen that there are several types of complaints in OCD cases, namely itch, redness, dry skin and pain. A total of 15 respondents (47%) complained of itching, as many as 8 respondents (25%) complained of reddish patches, while as many as 6 respondents (19%) complained of dry skin, and as many as 3 respondents (9%) complained of pain. The most locations occurred on the

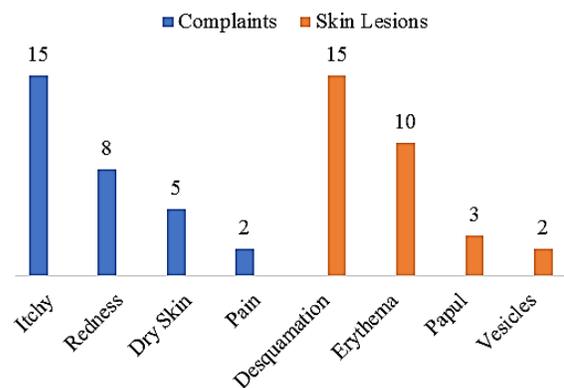
hands of 19 respondents, the cheeks of 10 respondents and the nose of 3 respondents.

**Evaluation of complaints and clinical manifestations of OCD cases in health workers at Dr. Soetomo Surabaya in Isolation Ward During the COVID-19 Pandemic**

Based on **Figure 5** above, it was found that the complaints that are often experienced by respondents with OCD in health workers are itching by 15 respondents (50%), followed redness of 8 respondents (26%). Meanwhile, OCD skin lesions on health workers in the form of desquamation as many as 15 respondents (50%) and itching as many as 10 respondents (33%).

**Evaluation of Materials Causing OCD Cases in Health Workers at Dr. Soetomo Surabaya in Isolation Ward During the COVID-19 Pandemic**

Based on **Table 1**, it can be seen that there are several types of PPE that cause OCD cases, namely gloves as many as 10 respondents (32%), hand hygiene activities as many as 9 respondents (28%), using oppo tape to glue hazmat clothes as many as 8 respondents (25%), N95 masks were 3 respondents (9%), and goggles were only 1 respondent (3%).



**Figure 5** Complaints and manifestations of health workers with OCD.

**Table 2** Types of personal protective equipment in OCD cases.

Personal protective equipment	Causative factor	Amount (%)
Gloves	thiuram-mix, carba-mix, ercapto-mix	10 (32%)
Hand hygiene oppo tape	alcohol, perfume biaxially oriented polypropyleneand water base acrylic adhesive, resins	9 (29%) 8 (26%)
N95 Mask	polyurethaneand polypropylene	3 (10%)
Googles	polycarbonate plastic	1 (3%)

\*One respondent can have more than one materials that causes occupational contact dermatitis.

## Discussion

### OCD Epidemiology Profile of Health Workers

The results of the study in **Figure 1** describe the age frequency distribution of respondents with OCD cases based on age, which can be identified by the most in the age group 26-35 years (early adulthood) as many as 22 respondents (79%), age 36-45 years (late adulthood) as many as 5 respondents (18%), 46-55 years old (early elderly) as many as 2 respondents (7%), and 17-25 years old (late teens) with only 1 respondent (4%). Contact dermatitis will be more easily affected in personnel with an older age. But in practice (based on the results of this study) workers with a younger age are actually more affected. In general, the younger age group is still quite active and productive at work, hence they are more often exposed to allergens. In this study, young health workers without comorbidities are suggested to work in isolation ward. On the other hand, many older health workers generally already have comorbidities, hence they are not suggested to work at isolation ward. Another reason that possibly be the explanation is that the majority of respondents who work in isolation ward are in the 26-35 year age group. This is in accordance with the research by Budiarisma & Suryawati (2020) which states that occupational contact dermatitis is more common in the 26-35 year age group (57%).<sup>18</sup>

The results of the study in **Figure 2** describe the distribution of respondents by gender consisting of 27 people (90%) women and 3 people (10%) men. This is supported by the results of research by Palomo *et al.* which shows that women (19.4%) suffer from OCD more than men (10.3%). The largest age group was the age group 12-45 years with 28 people (93.3%).<sup>19</sup>

Another study that supports Ginting *et al.* that contact dermatitis occurs most often in women (79.3%).<sup>20</sup> In another study conducted by Budiarisma and Suryawati, where the results of the study showed that 100% of female respondents experienced contact dermatitis due to work.<sup>18</sup> The occupations or activities with the most contact dermatitis are housewives (25.3%), OCD is often caused by cleaning agents (20%). Cleaners in the form of soaps or detergents that are used repeatedly and continuously can cause damage to the stratum corneum due to lipid erosion resulting in an increase in transepidermal water loss which causes the skin to lose its barrier function and facilitate cell damage.<sup>21</sup>

The results of the study in **Figure 3** describe the distribution of respondents based on the type of health professional position who experienced OCD. There were 20 respondents (60%) nurses, 8 respondents (26%) midwives, and 2 respondents (6%) doctors. Previous study discovers that there is a relationship between the level of education and the incidence of OCD.<sup>22</sup> The results of this study have proven that a

person's level of education has a significant relationship with the OCD incident. Hence, someone with a high level of education will have a lower risk, while low education causes the risk of contact dermatitis to be higher and also because of the frequency of contact with allergens. Respondents with higher education levels have knowledge of preventive activities to prevent contact dermatitis. The results of this study are similar with previous research.<sup>22</sup> This research proves that the number of OCD experienced by the medical profession is less than other professions.

### ***OCD Case Complaints of Health Workers***

The results of the study in Figure 4 illustrate that there are several types of complaints in OCD cases, namely itchy, redness, dry skin, and pain. A total of 15 respondents (47%) complained of itching, as many as 8 respondents (25%) complained of reddish patches, as many as 6 respondents (19%) complained of dry skin, and as many as 3 respondents (9%) complained of pain. The most locations occurred on the hands of 19 respondents, the cheeks of 10 respondents, and the nose of 3 respondents. In this study, there were two respondents who had more than one complaint.

The results of this study are in accordance with prior research<sup>23</sup> that the most common complaints are dry skin, redness, itching, and pain. The study also showed that the most eczema areas in medical personnel were in the location of the hands with a total of 34 people (18.2%) with complaints of itching. Symptoms that can be experienced due to OCD are acute lesions starting with erythema, pruritus and edema, urticaria that looks like plaque and will quickly turn into vesicles and sometimes become bullae. Erythema and edema are still present in the subacute phase, the vesicles begin to decrease then will become erosion, crusting

and desquamation. In the chronic phase, the skin will become dry, rough, cracked, gray, and thickened with an increase in skin lines or called lichenification.<sup>23</sup>

Hand is the first place to be affected, especially in the area between the fingers, but the inflammation that occurs can extend to the fingers, back of the hand, and wrist. This is because the interdigital area is an area that is more prone to allergen penetration.<sup>24</sup> Contact dermatitis more often affects thin skin, such as the backs of the hands and between the fingers. Frequent use of gloves and hand sanitizer at work will further increase the risk of OCD.<sup>25</sup> The use of latex gloves on the hands causes contact dermatitis due to work. Chemicals added during the latex glove manufacturing process can cause skin irritation. The ingredients in latex gloves can cause allergies. The main chemicals (major sensitizers) added in the rubber manufacturing process are accelerators and antioxidants which reach more than 90%, including chemical antigens (Thiuram-mix, Carba-mix, Mercapto-mix) and protein antigens (2-D electrophoresis). Thiuram-mix is a highly allergenic chemical (the strongest sensitizer) and is the most widely used in the rubber industry, especially in the manufacture of natural rubber latex gloves.<sup>26</sup> Delayed type (type IV) hypersensitivity reaction, resulting in allergic contact dermatitis. Symptoms usually develop within 24-48 hours of exposure of the skin or mucous membranes to latex in sensitized persons. The main allergens are residual accelerators and antioxidants left over from the original manufacturing process. Langerhans cells process the antigens and carry them to the skin T cells. Some objects may cause sensitization. Type IV hypersensitivity is more common in atopic individuals. Dermatitis may predispose the patient to further sensitization or infection.<sup>27</sup>

Occupational contact dermatitis can also be caused by wearing goggles for an extended period of time. This can occur when goggles that cover the entire face and neck restrict circulation, producing itching in the nasal area. The amount of research on skin responses associated with the usage of Goggles is currently limited. It is still unknown which compounds in the goggles can trigger allergic reactions. Furthermore, due to the use of N95 masks, there is work-related contact dermatitis in the cheek area. The hot and humid environment and grafting due to the use of N95 masks are factors that trigger skin problems. On the one hand, using a face mask to shield one's face from infectious diseases can be beneficial, but on the other hand, it can have negative impacts.<sup>28</sup> The allergens in the masks are thiuram, methylidibromo glutaronitrile, propylene diamine, guanidium diacetate, and dibromodicyanobutane where these allergens can trigger the sensitization process.<sup>29</sup>

Sharma offers numerous causes for the annoyance caused by the usage of PPE by health workers, the most significant of which is the long and humid working hours, necessitating the replacement of PPE.<sup>30</sup> The ideal time for replacement is every four hours. If for hours wearing PPE, an N95 mask or surgical mask and goggles will press the bridge of the nose and cheeks, the mask strap will press against the ears, and the surgical cap will then press against the forehead, which may be the main cause of skin rashes on several parts of the head and face. Moreover, wet skin combined with pressure increases the coefficient of friction between PPE and skin, and when masks and goggles are removed quickly can result in bruises.<sup>30</sup>

### ***Clinical Manifestations of OCD Cases in Health Workers***

The results of the study in **Figure 5** illustrate that the complaints that are often experienced by

respondents with occupational contact dermatitis in health workers are itching, which is 15 respondents (50%) and redness, which is 8 respondents (26%). Skin lesions of occupational contact dermatitis patients on health workers in the form of desquamation as many as 15 respondents (50%) and itching as many as 10 respondents (33%). The results of this study are supported by prior research that the most common symptoms of contact dermatitis are redness and itching of the skin.<sup>31</sup> Complaints of intense itching and a prominent red rash. The rash may blister in severe cases. A red rash is usually limited to the area that was in direct contact with the allergen, but the rash can appear in other areas of the body, if the allergen is transferred to that area. Washing off the allergen with soap and water can usually prevent this from spreading. The rash usually appears within 12 to 48 hours of exposure to the allergen, although in some cases it may not appear for up to two weeks.<sup>31</sup>

Clinical abnormalities of dermatitis can lead to a polymorphic efflorescence. Symptoms in acute irritant contact dermatitis, skin stinging, heat, burning, visible abnormalities in the form of erythema, edema, bullae, and necrosis can be found. The margins of the skin disorder are well-defined, and generally asymmetrical. Symptoms of cumulative (chronic) irritant contact dermatitis are classic symptoms of dry skin, erythema, scaling, gradually thickening of the skin (hyperkeratosis) and diffuse lichenification. The results of this study are supported by Rubianti and Prakoeswa of 289 patients, 256 patients with clinical manifestations of erythematous macules.<sup>32</sup> These results are also consistent with the Indonesian Association of Dermatologists and Venereologists (PERDOSKI) which states that in ACD, acute lesions are characterized by erythematous macules. Other investigations also found that the presence of erythematous macules that

characterize acute occupational contact dermatitis.<sup>33</sup>

### ***Evaluation of Materials Causing OCD Cases in Health Workers***

The results of the study in **Table 2** illustrate that there are several types of PPE that cause OCD cases, namely gloves as many as 10 respondents (32%), hand hygiene activities as many as 9 respondents (28%), the use of oppo tape to glue hazmat clothes as many as 8 respondents (25%), N95 masks were 3 respondents (9%), and goggles were 1 respondent (3%). There are two respondents who can have more than one ingredient that causes occupational contact dermatitis.

Chemicals added during the latex glove manufacturing process can cause skin irritation. Materials in latex gloves that can cause allergies include chemical antigens.<sup>34</sup> Delayed type (type IV) hypersensitivity reaction, resulting in allergic contact dermatitis. Symptoms usually develop within 24-48 hours of exposure of the skin or mucous membranes to latex in sensitized persons. The main allergens are residual accelerators and antioxidants left over from the original manufacturing process. Langerhans cells process the antigens and carry them to the skin T cells. Some objects may cause sensitization. Type IV hypersensitivity is more common in atopic individuals. Dermatitis may predispose the patient to further sensitization or infection.<sup>35</sup>

Latex glove powder comes from corn flour or talcum powder. Powder on gloves that are not absorbed in latex protein has the potential to cause irritant contact dermatitis because the entry of glove powder into the body can interfere with physiological functions.<sup>36</sup> Irritant contact dermatitis may be a local reaction to glove powder. Skin irritation associated with

glove powder is mainly related to its potential abrasive effect. All of these can cause dry, cracked and itchy skin on the back of the hand under the glove. This reaction usually occurs within a few minutes to several hours after contact with the gloves. Symptoms are limited to the area of glove contact and include: redness, cracking, blisters, dryness, peeling and cracking.<sup>37</sup> Although latex gloves provide good protection against infectious agents, they have also been associated with allergic reactions and irritation.<sup>38</sup>

Health care providers are at increased risk of occupational skin diseases caused by latex gloves due to the use and continuous contact with latex gloves by health workers. Contact dermatitis either allergic or irritant is the most common skin disease in the field and its incidence is estimated to reach 80% of all reported occupational diseases.<sup>39</sup>

According to WHO, OCD prevention in cases of hand dermatitis can be done by recommending washing hands using an alcohol-based hand sanitizer or hand rub for 20 to 30 seconds. Commonly used materials include alcohol, chlorhexidine, chlorocilenol, hexachlorophene, iodine, iodophors, quaternary ammonium compounds, triclosan and other materials. The way to wash your hands is also the same using 6 steps. Alcohol has a role in killing the virus (virucidal) with the target envelope of the virus. The effectiveness of hand sanitizers during this pandemic is evidenced by a systematic study, 9 out of 10 cross-sectional studies (case control) prove a decrease in nosocomial and community transmission.<sup>40</sup>

Hand dermatitis continues to increase during the COVID-19 pandemic. The most significant increase in cases was found in medical personnel. Research conducted in the United States on medical personnel proved that medical

personnel who worked 36 to 40 hours per week experienced the highest incidence of dermatitis (76.11%). Prior to the pandemic, it was noted that medical personnel experienced hand dermatitis due to wearing occlusive gloves for more than 5 hours per day. Women suffer more often than men (27.5%; 10.4%). Supporting from these data, when a pandemic occurs, there is an increase in hand washing starting from 5-10 times per day to 10-20 times per day. The results showed that before COVID-19, the frequency of washing hands was 10-20 times per day and during COVID-19 it was 20-30 times per day. In terms of hand washing, it was noted that as many as 76.6% of medical workers who washed their hands more than 10 times in a day experienced skin damage. A total of 27 doctors from 31 doctors experienced skin disorders and 35 nurses from 65 nurses also experienced skin disorders during the pandemic.<sup>41</sup>

Hand dermatitis nowadays often occurs due to hand hygiene behavior to prevent infection. Part of hand hygiene usually consists of water, surfactants, drying elements, and disinfectants. Each component has an effect on the epidermal barrier. The role of water, for example, can eliminate free amino acids which are components of natural moisturizing factors, which have a role in maintaining hydration from plasticization and desquamation of the stratum corneum. After contact with water, the skin becomes more alkaline while a good level of acidity is needed for the skin to carry out several functions including protective functions. Exposure to soap or cleansers and water causes significant structural and functional changes. In the epidermis there is hyperproliferation, structural damage, reduced ability to bind water, inadequate hydration and desquamation. After chronic surfactant exposure, there is an increased turnover of the stratum corneum. Neurosensory irritation of the skin caused by abnormalities in the stratum corneum due to an

increased immune response, accelerated neural response, and increased epidermal growth factor causing discomfort, itching, stinging and burning.<sup>42</sup>

The earliest symptoms that patients with hand dermatitis experience are dry, red and itchy hands. This is in accordance with a study conducted by Guertler *et al.* proving that among medical professionals, the most common symptoms were dry skin (83.2%), erythema (38.6%) and itching (28.9%). Around 90.4% of medical personnel had more than 1 complaint in the study. The distribution of lesions in hand dermatitis is generally characteristic. In irritant contact dermatitis, skin lesions are most common on the palms and distal to the dorsum digiti. If the dermatitis is dominant on the dorsum of the manus, digiti, interdigital area and wrist then allergic contact dermatitis is more likely to be the cause. In atopic dermatitis vesicles, pustules, or crusts are most common on the palms and digits.<sup>43</sup>

It is known that currently there are two kinds of hand hygiene, namely with running water and soap and using hand sanitizer. The use of running water turns out to have an effect in the form of increasing pH changes so that the pH becomes neutral. An increase in neutral pH causes an increase in proteases, leading to disruption of the function and integrity of the skin barrier. While soap is a product that contains synthetic detergents as a tool for washing or cleaning. Alkaline soap is able to remove debris, including normal flora, causing dry and irritated hands.<sup>41</sup>

The use of moisturizer is one way to reduce symptoms and prevent the severity of hand dermatitis. Lack of awareness in skin care causes this is often overlooked. Consequently, the average application of moisturizing cream during the COVID-19 pandemic increased

significantly.<sup>42</sup> Before the pandemic, the average use of moisturizer was 1 time per day and after the pandemic it was 1 to 2 times per day. However, the average use of hand moisturizer is still low. Based on the consensus in China on mucosal and skin protection during the pandemic, it is recommended to use emollients containing hyaluronic acid, ceramide, vitamin E, or other ingredients capable of repairing the skin every time after washing hands whenever possible.<sup>44</sup>

The use of oppo tape to glue hazmat clothes is often used by health workers as an effort so that there is no opening for outside air to enter the hazmat clothes or gowns of medical personnel. The use of this adhesive is often on the skin of the hands or face when used. Oppo tape materials that are often found can cause allergies to oppo tape, namely resins, turpentine, adhesives used such as acrylate and methacrylate. The types of allergies that commonly arise due to the use of plasters are irritant contact dermatitis and allergic contact dermatitis. In a study mentioned 37 people who were tested on ordinary adhesives and hypoallergenic adhesives the results were 17 people (45%) who showed allergic symptoms on the skin surface and only 4 people (10%) were sensitive to hypoallergenic adhesives.<sup>45</sup>

The use of masks aims to control the source of the virus, namely by preventing infected users from spreading the virus to others and as a preventive measure, namely by providing protection to uninfected users against exposure to the virus.<sup>46</sup> Masks are personal protective equipment used to prevent the spread of respiratory tract infections from airborne pathogens, droplets and body fluids.<sup>47</sup> The recommended masks consist of three types of masks namely medical masks, cloth masks and N95 masks.<sup>48,49</sup> The Center for Disease Control and Prevention (CDC) recommends everyone to

wear a cloth mask when in public because most individuals with COVID-19 who do not show symptoms can still transmit the virus (CDC, 2020). N95 masks are recommended for health workers who treat COVID-19 patients in places exposed to high concentrations of aerosols such as the COVID-19 intensive and semi-intensive care units. The use of medical masks is mandatory for all health workers and everyone entering health care facilities.<sup>46</sup>

Based on experimental research by Navarro-Trivino and Ruiz-Villaverde in Spain, the incidence of occupational skin diseases in health workers is 12.75%. The incidence of skin disorders on the face is 25.7% with the most cases being acne.<sup>50</sup> The cross-over study of regarding the relationship between the use of personal protective equipment (PPE) with skin disorders in health workers during the pandemic highlight that 526 health workers out of 542 health workers (97%) had skin disorders.<sup>51</sup> Another study regarding the continuous use of N95 masks stated that the reactions that often appear on the skin due to the use of masks are acne (59.6%), itching on the face (51.4%) and rashes on the face (35.8%).<sup>52</sup>

The use of masks can cause several effects on the skin such as physical trauma to the skin, acne, contact dermatitis, urticaria, and aggravate previous skin diseases.<sup>44,53,54</sup> The most common skin disorders are erythema, papules, scales, fissures, erosions, ulcers, vesicles, and wheals.<sup>53</sup> Clinical symptoms that are usually felt are dry skin, numbness, itching, and burning. The most commonly affected areas of the skin are the nose and cheeks. Complaints of contact dermatitis can be reduced and prevented by taking preventive measures in the form of using moisturizers on areas of the face that are often exposed to masks.<sup>55</sup>

Due to contact and pressure during use, goggles can cause skin problems such as urticaria

and contact dermatitis. According to a research, more than one-third of healthcare personnel experience acne, itchy skin, and even eczema owing to the use of goggles. The use of goggles by healthcare professionals can result in a condition closely akin to contact dermatitis, mainly itching. Research on skin responses associated with the use of Goggles is currently quite restricted. It is still unknown which compounds in the goggles can trigger allergic reactions.<sup>53</sup>

### Conclusion

On the basis of analysis and discussion, it can be concluded that the majority of OCD patients are female and that the most common age range is between 22-35 years. The occupation most affected by OCD who worked in the isolation ward during the pandemic was a nurse. The major complaint is itching, followed by redness of the skin, with the hands being the most common location. The majority of clinical manifestations are desquamation, followed by erythema-like skin lesions. Medical gloves are the type of personal protective equipment that causes OCD the most, followed by hand hygiene activities. High risk factors for OCD include a family history of atopic disease, a history of asthma, and an early history of atopic dermatitis. The highest incidence of OCD is associated with the use of gloves for more than 3 to 6 hours while working. 10 respondents perform hand hygiene activities 20 to 30 times per day. The incidence of OCD increases with the increasing frequency and duration of exposure to PPE and hand hygiene activities.

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