



## Bioscientia Medicina: Journal of Biomedicine & Translational Research

Journal Homepage: [www.bioscmed.com](http://www.bioscmed.com)

### Use of Personal Protective Equipment and Length of Work as Risk Factors for Occupational Contact Dermatitis on the Hands of Woodworkers

Angelina Aiyoslla Nabilla Putu Pratomo<sup>1</sup>, Ratih Pramuningtyas<sup>1\*</sup>, Flora Ramona Sigit Prakoeswa<sup>1</sup>, Yusuf Alam Romadhon<sup>1</sup>

<sup>1</sup>Faculty of Medicine, Universitas Muhammadiyah Surakarta, Surakarta, Indonesia

#### ARTICLE INFO

##### Keywords:

Contact dermatitis  
Allergens  
Irritant  
Personal protective equipment

##### \*Corresponding author:

Ratih Pramuningtyas

##### E-mail address:

[rp110@ums.ac.id](mailto:rp110@ums.ac.id)

All authors have reviewed and approved the final version of the manuscript.

<https://doi.org/10.37275/bsm.v6i18.746>

#### ABSTRACT

**Background:** Occupational contact dermatitis (OCD) is an inflammatory response caused by contact with allergens or irritants in the work environment, and this disease is most often found as an occupational disease. Personal protective equipment (PPE) is a safety tool that must be used by workers to protect the body from possible potential hazards in the workplace. Construction workers, woodworkers, batik workers, and farmers can take preventive measures to avoid the occurrence of OCD. This study aimed to determine the relationship between the length of work and the use of PPE on the incidence of OCD on the hands of woodworkers in Serenan, Klaten. **Methods:** Cross-sectional analytic observational study. A total of 30 research subjects participated in this study. The research subjects were woodworkers in Serenan, Klaten, Indonesia. Univariate and bivariate data analysis was carried out with the help of the SPSS program. **Results:** The majority of research subjects with OCD have worked for more than 3 years and do not use PPE. Studies show that there is a relationship between the length of work and the use of PPE with the incidence of OCD. **Conclusion:** There is a significant relationship between the length of work and the use of PPE on the incidence of OCD on the hands of woodworkers in Serenan, Klaten, Indonesia.

#### 1. Introduction

Occupational contact dermatitis (OCD) is an inflammatory response caused by contact with allergens or irritants in the work environment, and this disease is most often found as an occupational disease. The majority of cases of contact dermatitis are irritant contact dermatitis (ICD) and allergic contact dermatitis (ACD), which attack the hands. The most common complaints are itching and redness of the skin. The prevalence of OCD worldwide ranges from 1.3 to 8.1 per 10,000 workers per year. The prevalence in Indonesia shows that 97% of 389 skin disease findings are contact dermatitis, with ICD

66.3% and ACD 33.7%. The number of incidents of OCD on the hands in Indonesia is not known with certainty because workers do not directly report mild skin changes.<sup>1-5</sup>

Personal protective equipment (PPE) is a safety tool that must be used by workers to protect the body from possible potential hazards in the workplace. Construction workers, woodworkers, batik workers, and farmers can take preventive measures to avoid OCD by using personal protective equipment while working. The personal protective equipment commonly used by woodworkers is gloves which can reduce exposure to chemicals or wood particles used

by woodworkers. Length of work is the time a person spends at work and can affect the occurrence of OCD on the hands. The longer and more repeated exposure to chemicals or allergens, the occurrence of irritation or inflammation that damages the skin cannot be avoided.<sup>6-9</sup>

The furniture and craft industry in Indonesia has a high level of resilience during a pandemic. There are many requests for furniture that make woodworkers constantly work every day. This condition causes woodworkers to experience repeated exposure to chemicals and also raw materials for making furniture. The longer the woodworkers are exposed to chemicals and raw materials for making furniture. Moreover, if they don't use gloves, more cases of OCD on their hands will be found. Woodworkers have 2 processing processes, namely preparing and finishing. In the process of preparing, there will be a risk of OCD exposure and friction of sawdust, wood glue, and putty. On process finishing, woodworkers are exposed to chemical solvents (reactive diluent), preservatives, and hardeners, which are on thinner epoxy resins, finishes, and varnishes. This study aimed to determine the relationship between the length of work and the use of PPE on the incidence of OCD on the hands of woodworkers in Serenan, Klaten.<sup>10,11</sup> This research is focused on stages of preparing a location and exposure to the same irritants and allergens.

## 2. Methods

This study was an analytic observational study with a cross-sectional approach and used primary data from direct observation of the incidence of OCD in the hands of woodworkers in Serenan, Klaten, Indonesia. A total of 30 research subjects participated in this study. The research subjects met the inclusion criteria in the form of woodworkers aged at least 18 years, worked for at least 1 year, and were willing to participate in this study, which was marked by signing informed consent to become research

subjects. This study was approved by the medical and health research ethics committee of the Faculty of Medicine, Universitas Muhammadiyah Surakarta, Surakarta, Indonesia.

This study made observations on the patient's sociodemographic data, clinical data, and data on the history of PPE use in the study subjects. Data analysis was performed with the help of SPSS software version 25. Univariate analysis was performed to present the data frequency distribution for each variable. Bivariate analysis was conducted to determine the relationship between the use of PPE and length of work with the incidence of OCD on the hands of woodworkers in Serenan, Klaten, Indonesia, with a p-value <0.05.

## 3. Results

Table 1 presents the characteristics of the research subjects. The majority of research subjects are between 35-49 years old, which is classified as productive age. The majority of research subjects have worked for more than 3 years. The majority of research subjects did not use PPE, and the majority experienced OCD.

## 4. Discussion

Wood glue contains epoxy, which contains Diglycidyl ether of bisphenol A resin (DGEBA-R) and is the most common cause of occupational allergic contact dermatitis. The woodworkers studied used teak wood (*Tectona grandis*) as a raw material for making furniture. This wood has a sensitizer, deoxylapachol, strongest compared to other woods. False positives can occur in the patch test with sawdust due to its irritating nature. Deoxylapachol can actively sensitize when not doing a patch test at a concentration of 0.01%. Lapachol is another constituent of teak wood. All respondents worked 9 hours per day and only worked as woodworkers without other side jobs.

Table 1. Characteristics of research subjects.

Characteristics	Frequency	Percentage (%)
Age		
20-34 years old	5	16.7
35-49 years old	3	43.3
>50 years old	11	36.7
Length of work		
≤3 years	7	23.3
>3 years	23	76.7
Use of PPE		
Yes	8	26.7
No	22	73.3
OCD		
Yes	8	73.3
No	22	26.7

Table 2 presents the relationship between the length of work and OCD. The majority of research subjects with OCD have worked for more than 3 years.

Studies show that there is a relationship between the length of work and the incidence of OCD.

Table 2. Relationship between the length of work and OCD.

Length of work	Occupational contact dermatitis				P-value
	Yes		No		
	N	%	N	%	
≤3 years	2	28,6	5	71,4	0.007*
>3 years	20	86,9	3	13,04	

Table 3 presents the relationship between the use of PPE and OCD. The majority of research subjects with OCD did not use personal protective

equipment. Studies show that there is a relationship between the use of personal protective equipment and the incidence of OCD.

Table 3. The relationship between the use of PPE and OCD.

Use of PPE	Occupational contact dermatitis				P-value
	Yes		No		
	N	%	N	%	
Yes	2	25	6	75	0.001*
No	20	90	2	10	

Respondents who were diagnosed with OCD with a length of service >3 years totaled 22 people with a value of p=0.007, and this result indicates that there is a significant effect between the length of service and the occurrence of OCD. These results are similar to other studies, which state that factory workers who have daily contact for ≥ 5 hours suffer more from OCD. Other studies have reported similar things where the incidence of OCD was found more in workers with a length of service of between 5-10 years. Other studies

also state that length of service is related to OCD. Workers who have more work experience hardening phenomenon namely the condition of skin adaptation due to repeated exposure to both allergens and irritants, which causes skin changes such as hyperkeratosis, stratum corneum fat composition, changes in skin barrier permeability.<sup>12-14</sup>

The hardening phenomenon was the main clinical finding in this study. This occurs as a result of exposure to irritants and is explained by the theory of

altered skin barrier function. This theory states that there are morphological changes in the structure and composition of the skin in the thickened stratum layer of the granulosum. The thickening of the horn layer is proportional to the decreased transepidermal water loss (TEWL). In addition to morphological changes, there are changes in lipid composition in the stratum corneum, which contributes to changes in irritant response so that the skin hardens, which will cause irritant hyperactivity. Findings hardening phenomenon in this study can lead to the possibility of diagnosing irritant contact dermatitis due to work with the main exposure to friction and types of wood on the hands.<sup>15-20</sup>

## 5. Conclusion

There is a significant relationship between the length of work and the use of PPE on the incidence of OCD on the hands of woodworkers in Serenan, Klaten, Indonesia.

## 6. References

1. Aalto-Korte K, Suuronen K. Occupational allergic contact dermatitis caused by phenol formaldehyde resin in an interior coating for beverage cans. *Contact Dermatitis*. 2019. 80(2): 134-5.
2. Amado A, Sood A, Taylor JS. Chapter 48 Irritant contact dermatitis. Goldsmith LA, Katz SI, Gilchrist BA, Paller AS, Leffel DJ, Wolff K(Eds.), *Fitzpatrick's Dermatology in General Medicine*, 8e. McGraw Hill. 2012.
3. Anggraini M, Utami N. The Relationship between the use of personal protective equipment and dermatitis complaints in fish fishermen in Mela II Village, Central Tapanuli Regency, North Sumatra. *Prosiding Nasional FORIKES 2022: Pembangunan Kesehatan Multidisiplin, Ponorogo*. 2022; 74-7.
4. Anggraini D, Sutedja E, Achadiyani A. Etiology of allergic contact dermatitis based on patch test. *Althea Medical Journal*. 2017; 4(4): 541-5.
5. Antonov D, Schliemann S, Elsner P. Hand dermatitis: A review of clinical features, prevention, and treatment. *American Journal of Clinical Dermatology*, Flight. 2015; 16(4): 257-70.
6. Asbita I, Sudarjana M, Aryastuti A. Longstanding contact with work-related contact dermatitis among car wash employees in Denpasar. *AMJ (Aesculapius Medical Journal)*. 2022; 2(1): 45- 50.
7. Bissonnette R, Diepgen TL, Elsner P, English J, Graham-Brown R, et al. Redefining treatment options in chronic hand eczema (CHE). *Journal of European Academy of Dermatology and Venereology*, Flight. 2010; 24(3): 1-20.
8. Chafidz M, Dwiyaniti E. Old contact relationships, types of work, and use of PPE with the incidence of contact dermatitis in tofu workers, Kediri. *The Indonesian Journal of Occupational Safety and Health*. 2017; 6(2): 156-65.
9. Chern A, Chern C, Lushniak B. Occupational dermatitis. In: Kang S, Amagai M, Bruckner A, Enk A, Margolis D, McMichael A, Orringer JS (ed). *Fitzpatrick's 9th ed. Mcgraw Hill Companies*. New York. 2019; 438-57.
10. Goldsmith L, Katz S, Gilchrist BA, Paller AS, Leffel DJ, et al. *Fitzpatrick's dermatology in general medicine*, Ed. McGrawHill Medical, 2012; 2421-9.
11. Honari G, Taylor JS, Sood A. Occupational skin diseases due to irritants and allergens. Dalam: Wolff K, Goldsmith LA, Katz SI, Gilchrist BA, Paller AS, Leffel DJ, editor. *Fitzpatrick's dermatology in general medicine*. 8th ed. New York: McGraw-Hill. 2012.
12. John SM, Johansen JD, Rustemeyer T, Elsner P, Maibach, HI. *Kanerva's occupational dermatology*. Springer International Publishing. 2020.
13. Ministry of Industry. Grows 8 percent, industry is resilient in facing the impact of a

pandemic. Kementerian Perindustrian Republik Indonesia. 2021.

14. Lampel HP, Powell HB. Occupational and hand dermatitis: A practical approach. *Clinical Reviews in Allergy & Immunology*. 2019; 56(1): 60–71.
15. Lukmandaru G. Chemical properties of teak wood (*Tectona grandis*) at different growth rates (Chemical properties of teak wood at different growth-rates). *Jurnal Ilmu dan Teknologi Kayu Tropis*. 2010; 8(2): 188-196.
16. Mahfoudh A, Elmaleel O, Kalboussi H, Bouzgarrou L, Mahfoudh A, et al. Influence of age on patch tests results. *Turkish Journal of Dermatology*. 2017; 11(1): 12.
17. Makarim FR. Types of personal protective equipment. 2021.
18. Mekonnen TH, Yenealem DG, Tolosa BM. Self-report occupational-related contact dermatitis: prevalence and risk factors among healthcare workers in Gondar town, Northwest Ethiopia, 2018—a cross-sectional study. *Environmental Health and Preventive Medicine*. 2019; 24: 1-9.
19. Pangestika NW, Ariastuti NP. The behavior of using personal protective equipment related to occupational safety and health in wood sculpture craftsmen in the working area of the Ubud Health Center, Gianyar Bali. *Udayana E-Jurnal Medika Udayana*. 2015; 4(6).
20. Park SY, Kim JH, Cho SI, Kim KI, Cho HJ, et al. Induction of a hardening phenomenon and quantitative changes of ceramides in stratum corneum. *Annals of Dermatology*. 2014; 26(1): 35–42.