Risk Factor for Contact Dermatitis in Tofu Factory Workers in Medan

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Abstract

Background: Occupational contact dermatitis is one of the most common occupational skin diseases, caused by prolonged contact with irritants or allergens in the workplace. Some factors which play an important role in the development of occupational contact dermatitis can be host factors and external environmental factors (use of chemicals and wet working conditions).

Objective: To determine the risk factors for contact dermatitis in tofu factory workers in Medan.

Subjects and Methods: This study was an observational analytic study using a cross-sectional method involving 42 subjects. Multivariate analysis was carried out in order to find out more than one independent variables that have an effect on the dependent variable.

Results: The proportion of contact dermatitis in tofu factory workers was 30 subjects (71,4%) and 12 subjects (28,6%) was non-contact dermatitis. Subjects majority by the age group of 26–35 years (42,8%), working experience of more than 3 years (57,1%), contact duration ≥2 hours (100%), the most location was hands (71,4%), part of work was cooking (61,9%), no history of atopy (59,5%), and incomplete use of personal protective equipment (100%). Part of work in cooking section has a significant effect on the incidence of contact dermatitis.

Conclusion: The risk factor which has a significant effect on the incidence of contact dermatitis in tofu factory workers in Medan is part of work in cooking section.

Keywords: risk factors, contact dermatitis, tofu factory workers, occupational dermatitis

Introduction

Occupational contact dermatitis is one of the most common occupational skin diseases, namely as an inflammatory response caused by frequent or prolonged contact with irritants or allergens in the workplace.[1]

Factors that play a role in the occurrence of occupational dermatitis, namely host factors (such as history of atopy) and external environmental factors (such as use of chemicals, wet working conditions, and work practices) play an important role in the development of occupational contact dermatitis. and the most common symptoms are swelling, peeling or cracked skin, blisters, and skin that feels itchy and sore.[2,3]

Exposure to various fluids, especially water, can cause humid conditions so that work-related contact dermatitis easily occurs. This humid condition often occurs when in one working day, workers are in contact with water for more than 2 hours, wash their hands 20 times and use tight gloves for more than 2 hours.[4-6] Occupational dermatitis generally affects the hands which are the main tool for human work, but other areas of the body can also experience contact dermatitis, depending on the area of exposure to irritants or allergens.[6,7] This study is conducted to find the risk factor for contact dermatitis in tofu factory workers in Medan.

Methods

This study was an observational analytic study using a cross-sectional method involving 42 subjects. Sampling in this study using purposive sampling method. Subjects diagnosed with contact dermatitis and each subject had signed the informed consent. The exclusion criteria were subjects with psoriasis and fungal infection of the hands and feet.

Ethical permission is given by the Health Research Ethics Committee, Faculty of Medicine, Universitas Sumatera Utara, and Universitas Sumatera Utara Hospital Medan. History taking and clinical examination were conducted. The results were analyzed in descriptive analysis, bivariate analysis, and multivariate analysis to determine the correlation between part of work and history of atopy with contact dermatitis, with $p<0.05$ was considered significant.

Result

In this study, it was found that the proportion of contact dermatitis in tofu factory workers was 30 subjects (71.4%) that showed in table 1. The majority of tofu factory workers were aged 26–35 years old with a total of 18 subjects (42.8%) and it was found that tofu factory workers had the most contact dermatitis for ≥3 years, about 18 subjects (42.8%) (Table 2 & 3).

In this study show that the workers who had contact dermatitis and did not have contact dermatitis, total 42 subjects (100%) had the same contact duration of ≥2 hours in one day. The most common distribution of anatomic locations was hand in 30 subjects (71.4%) and feet in 12 subjects (38,1%). Table 4 shows that the part of the work in this study that experienced contact dermatitis was the cooking section in 24 subjects (57.1%) and there were 17 subjects (40.5%) with a history of atopy, while the subjects who did not have history of atopy as many as 25 subjects (59.5%) (Table 5). In this study it was found that all research subjects, total 42 subjects (100%) did not use complete personal protective equipment.

We then analyzed them with the Mann Whitney test which we found that there is no significant relationship between age and the occurrence of contact dermatitis and Chi Square test which we found there was no significant relationship between length of work and the occurrence of contact dermatitis, so it was concluded that age and length of work was not a risk factor for contact dermatitis.

Bivariate analysis with Fisher test shows that there is a significant relationship between part of work and the occurrence of contact dermatitis ($p<0.05$) and significant relationship between history of atopy and the occurrence of contact dermatitis ($p<0.05$), so these two independent variables can be used for multivariate analysis. The purpose of multivariate analysis is to find out the independent variables that have an effect on the dependent variable. Multivariate analysis using logistic regression test shows that part of work in cooking section has a significant effect on the incidence of contact dermatitis ($p<0,003$), while history of atopy does not have a significant effect on the incidence of contact dermatitis ($p<0,998$).

Table 1. The proportion of contact dermatitis in tofu factory workers

Dermatitis	**Subjects**	
	n	**%**
Contact Dermatitis	30	71,4
Non-Contact Dermatitis	12	28,6
Total	42	100

Table 2. The relationship between age and the incidence of contact dermatitis in tofu factory workers

Age (year)	**Contact Dermatitis (%)**	**Non-Contact Dermatitis (%)**	**Total (%)**	**p**
17–25	9 (21,4)	1 (2,4)	10 (23,8)	
26–35	9 (21,4)	9 (21,4)	18 (42,8)	
36–45	11 (26,2)	1 (2,4)	12 (28,6)	0,976
46–55	1 (2,4)	1 (2,4)	2 (4,8)	
Total	30 (71,4)	12 (28,6)	42 (100)	

Table 3. The relationship between length of work and the incidence of contact dermatitis

Duration of works (year)	Contact Dermatitis (%)	Non-Contact Dermatitis (%)	Total (%)	p
≥3	18 (42,8)	6 (14,3)	24 (57,1)	0,554
<3	12 (28,6)	6 (14,3)	18 (42,9)	
Total	30 (71,4)	12 (28,6)	42 (100)	

Table 4. The relationship between part of work and the incidence of contact dermatitis

Part of work	Contact Dermatitis (%)	Non-Contact Dermatitis (%)	Total (%)	p
Cooking Section	24 (57,1)	2 (4,8)	26 (61,9)	0,001
Not Cooking Section	6 (14,3)	10 (23,8)	16 (38,1)	
Total	30 (71,4)	12 (28,6)	42 (100)	

Table 5. The Relationship between history of atopy and the incidence of contact dermatitis

History of Atopy	Contact Dermatitis (%)	Non-Contact Dermatitis (%)	Total (%)	p
Yes	17 (40,5)	0	17 (40,5)	0,001
No	13 (30,9)	12 (28,6)	25 (59,5)	
Total	30 (71,4)	12 (28,6)	42 (100)	

Discusion

Occupational contact dermatitis is an occupational skin disease that refers to any irritation to the skin arising from direct exposure to exogenous agents in the work environment.[3] It occurs when the normal epidermal barrier is disrupted by an irritant and often depends on the concentration of the irritant or the duration of exposure, without any prior exposure to the substance to produce an effect. Effects can be seen in minutes to hours. Wet work has been identified as the most common occupational exposure to contact dermatitis.[3,8]

Table 1 showed that the proportion of contact dermatitis in tofu factory workers was 30 subjects (71.4%). The results obtained were in line with the study by Chafidz et al who reported that 18 subjects (72%) had contact dermatitis and 7 subjects (28%) did not have contact dermatitis.[9] Daulay's research on tofu factory workers in Sukamaju Binjai Village stated that 19 subjects (52.8%) had contact dermatitis, while 17 subjects (47.2%) did not had contact dermatitis.[10] Occupational contact dermatitis is inflammation of the skin due to contact through various physical, chemical, and biological substances in the workplace.[11,12]

The majority of tofu factory workers were aged 26–35 years old with a total of 18 subjects (42.8%). The results are in line with the study by Bhuvaneshwari et al which reported the highest incidence of occupational contact dermatitis in the ages of 30–39 years, about 31 subjects (31%).[13] The study by Chen et al also reported that the average age of workers with occupational contact dermatitis was 33.9 ± 8.7 years.[14] Research by Sakhvidi et al stated that the average age of workers with occupational contact dermatitis is 32.79 years.[1] Contact dermatitis can occur at any age, but this result may be due to the fact that this group is a productive age group. In this study, it was found that tofu factory workers had the most contact dermatitis for ≥3 years, about 18 subjects (42.8%). Research by Tas found that the average working period affected by contact dermatitis was 12.1

months ± 7.2 months.[15]

The workers who had contact dermatitis and did not have contact dermatitis, totaling 42 subjects (100%) had the same contact duration of ≥2 hours in one day. These results are in line with Daulay's study which reported that the average length of contact between research subjects was 2.50 ± 2.31 hours.[10] The study by Chafidz et al reported that 14 subjects (93%) had contact duration of ≥5 hours per day and experienced contact dermatitis, while subjects who did not experience contact dermatitis were 1 subjects (6.7%).[9] Prolonged exposure to water can cause structural changes in the stratum corneum depending on the frequency of exposure, making it easier for the penetration of extrinsic irritants or allergens, which causes contact dermatitis.[16]

The most common distribution of anatomic locations in this study was hands, amounting to 30 subjects (71.4%). The results are in line with the study of Bhuvaneshwari et al who reported the anatomical location of the clinical features of occupational contact dermatitis, about the hands of 73 subjects (73%) and the feet of 19 subjects (19%).[13] Research by Chen et al stated that hands were the main site involved in contact dermatitis due to work, namely 64 subjects (71.1%).[14] Contact dermatitis on the hands is often found as a clinical manifestation, because hands are the most frequently exposed parts in the workplace.[17]

In table 5 shows that part of work in this study which experienced contact dermatitis was cooking section, 24 subjects (57.1%). These results are in line with Chafidz et al who reported that part of work which experienced contact dermatitis the most was cooking section, about 10 subjects (55.6%), while another part of work other than cooking section that have contact dermatitis was 3 subjects (12%).[9] Cooking section in this study is the part of the work with more frequent exposure to water. Exposure to wet work is an important risk factor for hand dermatitis. Duration of exposure to wet work and high frequency of hand washing have been found to be associated with the development of occupational contact dermatitis on hands.[18]

In this study, there were 17 subjects (40.5%) with a history of atopy. The study by Sakhvidi et al stated that subjects with contact dermatitis had a history of atopy, namely as many as 14 subjects (48.3%).[1] Similarly, the study by Schwensen et al found that 191 subjects (19.1%) had contact dermatitis and had a history of atopy.[8] Subjects who experienced occupational contact dermatitis in the Witasari et al study found that 9 subjects (18%) had a history of atopy, while 27 subjects (54%) did not have a history of atopy.[19] Individuals with a history of atopic dermatitis is 2.4 fold increased risk for contact dermatitis. Atopic dermatitis is associated with impaired skin barrier function even in non-lesional skin. Therefore the decreased function of skin barrier in atopic dermatitis will facilitate the penetration of irritants and allergens into the skin, causing an immune and inflammatory reaction.[20] It was found that all research subjects, total 42 subjects (100%) did not use complete personal protective equipment. This is in accordance with Chafidz et al research on tofu factory workers in Kediri that reported the use of personal protective equipment that only used boots, as many as 18 subjects (72%), while wearing gloves was not found.[9] Research by Daulay with results on workers of tofu factory in Sukamaju Binjai Village reported that out of 36 subjects, 31 subjects (86.1%) did not wear complete personal protective equipment and 5 subjects (13.9%) wore complete personal protective equipment.[10]

Conclusion

The risk factor which has a significant effect on the incidence of contact dermatitis in tofu factory workers in Medan is part of work in cooking section.

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Author Contribution

All authors have contributed to this research process, including preparation, data gathering, analysis, drafting,and approval to publish this manuscript.

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Conflict of Interest

The authors declare no conflict of interest regarding the publication of this article.

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