

RISK FACTORS RELATED TO CONTACT DERMATITIS IN WORKERS DUE TO PESTICIDE EXPOSURE AT PALM OIL PLANTATION IN INDONESIA

Maksuk,^{*1} Intan Kumalasari¹, Ardiansyah²

¹Departement of Epidemiologic Surveillance, Palembang Health Polytechnic, South Sumatera, Indonesia,

²Public Health Program, Bina Husada Palembang, South Sumatera, Indonesia, e-mail

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ABSTRACT

Background: Pesticides are the most widely used chemicals to control pests and diseases in Indonesia, especially in plantations, including oil palm plantations. Exposure to pesticides can cause health problems and death. One of the most common health problems caused by exposure to pesticides is contact dermatitis.

Purpose: The purpose of this research was to analyze of risk factors related to contact dermatitis in workers due to pesticide exposure in palm oil plantations. **Methods:** This research is an analytic observational study with a cross sectional design. This research was conducted in palm oil plantations in Banyuasin Regency on April - October 2016, with a sample of 60 respondents; the samples were taken randomly. **Results:** This research showed that there was an relationship between that length of work ($p = 0.0005$; $OR=22$; $95\% CI = 3.22 < OR < 150.25$), spraying followed the wind direction ($p = 0.0005$; $OR=22$; $95\% CI = 18.5 < OR < 125.23$), use of personal protective equipment $p = 0.0005$; $OR=7.86$; $95\% CI = 2.71 < OR < 22.78$), and decontamination after spraying $p = 0.0005$; $OR=12.14$; $95\% CI = 3.21 < OR < 45.9$) were associated with contact dermatitis.

Conclusion: The majority of workers experience contact dermatitis caused by the length of work, spraying upwind, using personal protection was incomplete and unstandardized, and do not decontamination after exposure to pesticides. Therefore, companies must provide a special room for cleaning the body, and personal protective equipment must be available completely and according to standards.

Correspondence Author: Maksuk,
maksuk@poltekkespalembang.ac.id
Palembang Health Polytechnic,
South Sumatera, 30121, Indonesia

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INTRODUCTION

Pesticides are chemical substances used to eradicate or prevent pests and diseases that damage crops and weeds (M. Maksuk, Pratiwi, Amin, & Suzzana, 2019; WHO, 2010). Currently the amount of pesticides allowed in circulation and has reached 3,207 formulation for agriculture and forestry as well as 394 pesticide formulations that are used for household and human disease vector control (Direktorat Jendral Prasarana dan Sarana Pertanian., 2016). The use of Pesticide has a positive impact on the companies' plantation and also have a negative impact, especially on healthcare workers; one of them is contact dermatitis.

Contact dermatitis is an occupational dermal disease caused by chemical, biological and psychological hazards, and as a skin disease, most of the second after musculoskeletal disorders, about 22% of all occupational diseases (Belsito, 2005). Contact dermatitis is an acute or chronic inflammatory reaction to a substance that sticks to the skin (Wolff & Johnson, 2009). In addition, to their exposure to allergens and irritants, many individual and environmental factors play a role in the development of the disease (Mortz & Andersen, 2008). Exposure to pesticide-active ingredients is very irritant, particularly dermal; contact with skin causes skin redness, blistering, or ulceration and cause contact dermatitis (Horiuchi, Oguchi, Nagami, & Nishigaki, 2008).

Palm oil is one of the dominant commodities currently, and this causes an increasing area of land used for oil palm plantations. The area of palm oil plantations in Indonesia until 2015 was around 30,948,931 Ha; in South Sumatra Province, every year, it increased in 2015 to around 1,161,043 Ha (DirjenPerkebunan, 2015), and in Banyuasin Regency, the area of oil palm plantations was around 141,238 Ha (Disbun Sumsel, 2013). The wider the existing oil palm plantations, the more workers involved, thus increasing the use of pesticides. This condition causes workers' exposure to pesticides to be more frequent.

The author's interview with the sprayer showed that workers use pesticides daily for approximately 7-8 hours/day. Therefore this study aimed to analyze the risk factors of contact dermatitis in workers exposed to the pesticide in palm oil plantations.

METHODS

The study was an observational analytic using a cross-sectional design. The population of this study is all of the workers as a sprayer and supervisors in palm oil plantations with a sample size of 60 respondents, with the inclusion criteria being working for more than six months, work activity as applicators, and supervisors. Data collection is carried out randomly. This research was conducted at Palm Oil Plantation in Banyuasin District from April to October 2016.

Data were collected through interviews using a questionnaire. The data were analyzed by univariate and bivariate using a chi-square test. This research has passed the ethical test from the Faculty of Medicine, Sriwijaya University.

RESULTS

The results of the univariate analysis are presented in Table 1 and Table 2 below:

Table 1
Distribution of Respondents Based on the Incidence of Contact Dermatitis, Characteristics of Respondents (n = 60)

Variables	Frequency (n)	Percentage (%)
Contact Dermatitis		
- Yes	37	62
- No	23	38
Age		
- ≥ 34 years	32	53,3
- < 34 years	28	46,7
Gender		
- Male	23	38,3
- Female	37	61,7
Education Level		
- Low (elementary school, Junior High School)	42	70
- Higher (Senior High School, Diploma)	18	30
Work Period		
- ≥ 2 Years	33	55
- < 2 Years	27	45
The length of work		
- ≥ 7 hours/day	36	60
- < 7 hours/day	24	40
Work Activity		
- Applicators	45	75
- Supervisors	15	25

Table 2
Distribution of Respondents Based on Direct Exposure, Personal Protective Equipment and Decontamination

Variables	Frequency (n)	Percentage (%)
Body contacts during application		
- Yes	57	96
- No Contact	3	5
Spraying followed the wind direction Spraying upwind		
- No	38	63,3
- Yes	22	36,7
Eats/drinks/ smokes during spraying		
- Yes	37	61,7
- No	23	38,3

The use of personal protective equipment		
- Incomplete	35	58.3
- Complete	25	41.7
Decontamination after spraying		
- No	46	76.7
- Yes	14	23.3

Based on Table 1 and Table 2 could be explained that the incidences of contact dermatitis is high enough at palm oil plantation in Banyuasin as many as 62%, the length of work ≥ 7 hours/day of 60%, Eats/drinks/ smokes during spraying of 61.7%, the use of personal protective equipment in complete of 58.3%, no decontamination after spraying of 76.7%.

Table 3
Associations between Indirect exposure, Direct exposure, occupational safety and health with Contact Dermatitis (n = 60)

Variables	Contact Dermatitis				p value	OR (95% CI)
	Yes		No			
	n	%	n	%		
Age						
- ≥ 34 Years	23	71.9	9	28.1	0.082	2,556 (0.878 – 7.443)
- < 34 Years	14	50	14	50		
Gender						
- Male	15	65.2	8	34.8	0.656	1.278 (0.434 – 3.766)
- Female	22	59.5	15	40.5		
Education Level						
- Low	25	58.1	18	41.9	0.371	0.505 (0.173 – 1.478)
- Higher	12	70.6	5	29.4		
Work Period						
- ≥ 2 years	18	54.5	15	45.5	0.210	0.520 (0.185 – 1.459)
- < 2 years	19	70.4	8	29.6		
The Length of Work						
- ≥ 7 hours/day	33	91.7	3	8.3	0.0005	22.000 (3.221– 150.245)
- < 7 hours/day	1	4.2	23	95.8		
Work Period						
- ≥ 2 Years	18	54.5	15	45.5	0.210	0.520 (0.185 – 1.459)
- < 2 Years	19	70.4	8	29.6		
Spraying followed the wind direction Spraying upwind						
- No	37	92.5	3	7.5	0.0005	18.500 (2.733– 125.229)
- Yes	1	5	19	95		
Eats/drinks/ smokes during spraying						
- Yes	6	60	9	40	0,550	0.697 (0.213 – 2.284)
- No	20	48.9	23	51.1		
The use of personal protective equipment						
- Incomplete	33	94,3	2	5,7	0.0005	7.857 (2.710– 22.784)
- Complete	2	12	23	88		
Decontamination after spraying						
- No	34	97,1	1	2,9	0.0005	12.143 (3.210– 45.937)
- Yes	2	8	23	92		

Based on Table 3 could be explained that variables associated significantly with contact dermatitis were the length of work, respiratory exposure, the use of personal protective equipment, decontamination after spraying, with p value $< 0,05$.

DISCUSSION

Most of the workers aged ≥ 34 years, they are the productive age group. Following the study on workers spraying weeds in PT.Agro Mas Seruyan District reportedly most age groups between 20-35 years of as many as 79.2% (Djau, 2009). The study at palm oil plantation reported that majority of the workers were the productive age (Maksuk, Tan Malaka, Suheryanto, 2016; P. A. Maksuk & Suzanna, 2017). Besides exposure to pesticides on cut flowers, the age group is 20-35 years (Del Prado-Lu, 2007), and the farmers who use pesticides more than 60-69 years were 22% (Waggoner et al., 2013).

The workers exposed to pesticide in palm oil plantations are more female than the male because the number of female workers is as many as sprayers in palm oil plantations. The farmers exposed to herbicides in paddy-Sri Pura Sri Lanka were more the men (Jayasumana et al., 2015), and exposure to pesticides on cut flowers majority were men as many as 52% (Del Prado-Lu, 2007).

Fewer education workers than the highly educated, with so many low-education workers lead to a lack of knowledge receive information regarding applying pesticides appropriately and correctly. The majority of sprayers in oil palm plantations have elementary school education (Maksuk, Tan Malaka, Suheryanto, 2016). Besides, The farmers spray the onion in Ngurensiti Pati most primary education was 62% (Budiawan, 2013).

The results showed that working period ≥ 2 years more than < 2 years. The working period may influence the time of pesticide exposure for activity as sprayers and supervisors in the field. The study reported that farmers who work for more than 15 years experience health complaints, it is due to pesticide exposure time longer (Mahyuni, 2015). This study is in line with the results of research which reported that the majority of pesticide sprayers had been working for more than 3 years (M. Maksuk et al., 2019). The workers were spraying ≥ 7 hours a day more; it can cause workers to be a more long exposure to pesticide. WHO recommended that workers may

be exposed to spray pesticides for 5-6 hours per day, and in the development of guidelines for the use of pesticides has been determined that an applicator apply the pesticide spraying continuously, not more than 4 hours per day (KementanRI, 2011). In addition, the farmers spray pesticide for 3 hours/day, as many as 43.6%, and 6 hours /day in Berastagi District (Mahyuni, 2015). Based on a research report that the work activity of cutting flowers was stirred (76.4%), spraying (77.4%), and mixed (76.4%) (Del Prado-Lu, 2007). The sprayers are more than supervisors in the field, but supervisors and applicators are equally at risk of pesticide exposure because they were in the field when spraying.

The workers touch mouth more than eat/drink or smoke during spraying. It can cause pesticide into the body through the ingestion or swallowing when eating/drinking during spraying. Based on study reported that the workers blowing nozzle with a mouth about 22%, touching their mouth when spraying about 11% (Murphy et al., 2000). Based on guidelines pesticide use has also been determined when spraying pesticides should not be eating / drinking / smoking and not touching the mouth/nose/ face with hands contaminated with pesticides (KementanRI, 2011).

The majority of pesticide spraying workers use incomplete personal protection, because they feel hot and uncomfortable. A previous study, reported that most of workers usage personal protective equipment when spraying herbicides in palm oil plantations are not complete (Djau, 2009; P. A. Maksuk & Suzanna, 2017). In addition, women of childbearing age farmers exposed to pesticides were not use personal protective equipment was completely (Murphy et al., 2000).

Decontamination after spraying as many as 60%, they do not wash their hands using soap but only wash hands with water in canal. This is due in no special room for workers to clean the body after spraying pesticides. pesticide could also cause poisoning incidents when the workers eat without washing their hands after exposure to pesticide, but another study reported that more than 8,500 respondents said they washed their hands immediately after spraying as many as 77% (Matthews, 2015). Decontamination must be done by workers especially after spraying; it is to minimize pesticide attached to the skin. Availability of a special room for decontamination after exposure to pesticide is very important.

The limitation of this study is Skin examination is only based on complaints felt by

workers experiencing symptoms experienced by workers.

CONCLUSION

The majority of workers experience contact dermatitis due to exposure to pesticides. It is significantly related to length of work, respiratory exposure, use of personal protective equipment is not complete, and decontamination after spraying.

Therefore, the company must reduce the length of work and adjust to the requirements that workers be exposed to pesticides 4-5 hours/day and the frequency to spray at least three times a week. The provision of personal protective equipment should be complete and appropriate, and a special room for decontamination should be available in the plantation area.

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