

Factors Related to the Incidence of Pesticide Toxicity in Pesticide Traders in Paser District in 2018

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Abstract

Pesticide sale circumstances in Paser District through measuring cholinesterase enzymes by the laboratory of the Paser District on the blood of pesticide traders found 37.5% experienced organopospat group pesticide toxicity. This research aim to analyze risk factors related to the level of pesticide toxicity in pesticide traders namely age, nutritional status, educational level, length of work, work period and use of personal protective equipment. The study design used was observational with a cross sectional approach. The number of samples is 42 people taken by simple random sampling. Measurement data using observation and examination sheet cholinesterase levels in the blood of respondents using Tintometer tool brands in ScienPro Pest 100. The data were analyzed using Chi-square and multiple logistic regression. Pesticide traders who experienced pesticide toxicity were 42.9%. Result of Chi-Square test shows three variables that have a significant relationship with the incidence of pesticide toxicity. Risk factors for pesticide toxicity were age ($p=0.021$; OR=6.250; 95% CI=1.511-25.860), length of work ($p=0.038$; OR=6.769; 95% CI=1.268-36.139) and work period ($p=0.043$; OR=4.900; 95% CI=1.238-19.399). Multiple logistic regression showed that the most dominant factor associated with the incidence of pesticide toxicity namely the length of work and work period. Risk factors associated with the incidence of pesticide toxicity are age, length of work and work period where is the last two are the dominant factors.

Keywords: *pecticide, toxicity, age, length of work, work period*

Introduction

Pesticides are toxic and dangerous materials, if not managed properly it will have a negative impact on health. One of the places that manages pesticides is the pesticide management sites. Scope of supervision of pesticide management sites, namely pesticide factories, plantations, shops, or Village Unit Cooperatives. The place to pesticides selling that are not properly managed will cause pollution to the surrounding environment and

can cause health problems for the surrounding community or its management whether acute or chronic.¹

Based on data from the Agriculture Office East Kalimantan Province in 2016, the number of pesticide sellers in East Kalimantan was 228, spread across 10 municipal Districts. Use of chemical pesticides for the delivery of plant pests and disease vectors tends to increase constantly. High use of pesticides increase to the health risks faced by both pesticide operators and the community at large. Health risks experienced by users of pesticides (industrial workers, formulators, applicators) usually related to the security method, storage, and use of pesticides. While the health risks experienced by the wider community are generally due to contamination of pesticides that enter the food chain, and poisoning of pesticides due to ingestion, inhalation and direct contact with the skin.^{2,3,4}

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Previous studies in Subang concluded that, 66.1% of workers working at pesticide sales sites experienced organophospat group pesticide toxicity. Likewise, 78.8% of pesticide sales people in the city of Bengkulu experienced pesticide toxicity. The same was shown in the Pasamanan sub-District where nearly 50% of pesticide management workers experienced pesticide toxicity.^{5,6}

Data from the Paser District Health Laboratory (2018), which states that 37.5% of pesticide traders were identified as organophospat group pesticide poisoning with an average age of 39 years. The data also states that the people who are poisoned are male, with an average work period of 8 years and a long working average of 8 hours per day. In addition, 25% of traders have poor nutritional status, with 75% of traders having high school education, and 100% of pesticide traders not using Personal Protective Equipment (PPE) when managing pesticides.

This research was conducted to find out the relationship between pesticide toxicity in pesticide

traders in Paser District, especially the relationship between age, nutritional status, education level, length of work, length of service, and use of PPE.

Materials and Method

This study was an analytic observational study with a cross sectional design. The population in this study are all traders or workers who work in pesticide shops as many as 97 people. Sampling technic by simple random sampling, the sample size is determined by the formula of lemeshow is 42. Sources of data from the primary data were collected using observation and interview sheets and blood sampling of respondents. Data taken includes data on pesticide toxicity, age, nutritional status, education level, length of work, work period, and use of PPE, as well as reference books related to research. Analysis using univariate, bivariate analysis using Chi-square test and multivariate analysis using the Logistic Regression Test.

Findings and Discussion

Table 1. Frequency Distribution of Variables

No.	Variable	Frequency	Percentage
1	Poisoning		
	Poisoning	18	57,1
	Normal	24	42.9
2	Age		
	<18 years or> 45 years	14	33.3
	18 - 45 years old	28	66.7
3	Level of education		
	basic education	21	50
	Middle education	21	50
	higher education	0	0
4	Nutritional status		
	Normal	29	69
	Abnormal	13	31
5	Length of working		
	≤ 5 hours / day	13	31
	> 5 hours / day	29	69
6	Years of service		
	≤ 5 years	18	42.9
	> 5 years	24	57,1
7	Use of PPE		
	≥ 4 PPE	0	0
	<4 PPE	42	100

Age

The results of Chi-square test with p-value 0.021 ($p < 0.05$) with OR 6.25 which means that there is a significant relationship between the age of the trader and the incidence of pesticide toxicity. The farmers aged 40 years are more likely to suffer from pesticide poisoning.⁷ The age of pesticide traders over 35 years is more likely to experience pesticide toxicity compared to under 35 years of age.⁸ People who are older, they get more experience and exposure. Their metabolic function will decrease and result in a cholinesterase activity so that it will facilitate pesticide toxicity. Age is also related to immunity the body in overcoming the level of toxicity of a substance, the older the age of a person, the effectiveness of the immune system in the body will decrease.

Nutritional status

The results of Chi-square test obtained p-value 0.162 ($p < 0.05$), which means that there is no significant relationship between the nutritional status of traders and the incidence of pesticide toxicity on traders. The number of pesticide traders who have good/normal nutrition is 58.1% compared to pesticide traders who have poor nutritional status.⁵ There are no relationship between nutritional status and the incidence of pesticide toxicity in the pesticide trader in Subang and West Lombok District, Wonosobo and Magelang District farmers.^{8,9,10}

Respondent with a poor category of nutritional status 69.23% is a pesticide trader who experiences overweight, this can result in toxic substances that can be stored in body fat tissue, so that the effects of poisoning cannot be detected. There is a positive relationship between the percentage of body fat and respondent's cholinesterase levels, meaning that the higher the body fat percentage, the more the number/dose of pesticides needed for the occurrence of low cholinesterase levels.¹¹

Education Level

The results of statistical analysis using the Chi-square test with p-value 0.119 ($p < 0.05$) which means that there is no significant relationship between the level of education with the incidence of pesticide toxicity in pesticide traders. There is no relationship between education level and pesticide toxicity on traders.^{8,12} The formal education received by respondents does not necessarily indicate the actual level of knowledge about pesticides, a lot of knowledge about pesticides

is actually obtained through education and training activities specifically for this matter, and especially for traders of pesticides that this can be done by the agency agriculture, health services and agents of pesticide brands.

Length of Work

The results of statistical analysis using the Chi-square test obtained p-value 0.038 ($p < 0.05$) with OR 6.769 which means that there is a significant relationship between the length of work of traders and the incidence of pesticide toxicity at pesticide traders. There was a relationship between the length of work and the incidence of pesticide toxicity in farmers in the Jambi and Brebes Muaro.^{13,14}

Respondent who has more than five hours of work per day with a working period of more than 5 years as much as 40.5% where the respondent who works more than five hours with a larger work period is 8.85 years compared with respondents with working time of less than 5 hours which has an average working period of 6.76 years. This shows that the longer people work, the more likely they are to be exposed to dangerous substances. In addition, respondents who work more than 5 hours per day and also work long periods of time will cause continuous and repeated exposure to pesticides which causes a very high risk of pesticide toxicity. The main factors causing toxicity are the length of exposure, concentration/dose of exposure and thickness in individuals affected by age, nutritional status, sex and others.¹⁵

Work Period

The results of statistical analysis using the Chi-square test obtained p-value 0.019 ($p < 0.05$) with OR 4.900 which means that there is a significant relationship between the length of work of traders and the incidence of pesticide toxicity at pesticide traders. There was a relationship between the length of work and the incidence of pesticide toxicity in farmers in Tomohon and Brebes.^{13,16} There are significant differences in toxicity due to pesticides among farmers with employment < 5 years and ≥ 5 years.

Work period is one of the factors that influence the level of cholinesterase in the blood of the respondent, where the longer the period of work, the lower the level of cholinesterase in the blood of the respondent so cause the risk of pesticide toxicity.¹⁸ The length of work as a pesticide trader influences the incidence of poisoning

because exposure to pesticides in a short time can lead to toxicity in traders. Chronic organophosphate poisoning symptoms arise due to inhibition of cholinesterase and will mense tap for 2-6 weeks, resembling mild acute poisoning. But, when exposed again in a small number of severe symptoms may arise.

Use of PPE

Influence personal protective equipment (PPE) at the pesticides sale sites has no relationship. The results of this study indicate that the proportion of pesticide traders does not use complete personal protective equipment (PPE), so statistical analysis cannot be done. Although the results of the study showed no association between the use of PPE and the incidence of poisoning in traders but it is necessary to recommend the use of PPE when mixing/repacking pesticides because of the potential for the most contact to occur at that time.

Dominant factors

Based on the results of logistic regression analysis, the variables have p-value <0.05 is the length of work p-value 0.028, OR 9.587 and work period p-value 0.044, OR 6.005. The calculation of probability for the incidence of pesticide toxicity in pesticide traders can be predicted based on influential variables, $P = 0.725$ or 72.5%. So, pesticide trader with a service period of > 5 years; length of work per day > 5 hours have probability for pesticide poisoning of 72.5%.

The length of work and working period is a strong determinant of the incidence of pesticide toxicity in farmers.¹³ Both of these risk factors (length of work and working period) reinforce each other based on multivariate analysis. Results of research shows that the longer the life of the farmer, the lower the enzyme activity of blood kolinesterase explain that vegetable farmers who have been exposed for a long time or are persistent are at risk of getting poisoned at the next level. This is made worse by all pesticide traders in Paser regencies who make contact with pesticides, which are not used to wearing personal protective equipment (PPE), even if wearing does not meet the requirements. Length of work and work period with pesticides must be wary, because the longer the contact pesticide, the greater the exposure to pesticides in the sale.¹⁶

Conclusion

As many as 18 respondents (42.9%) experienced

pesticide toxicity and 24 others (57.1%) did not experienced. There is a relationship between age, length of work and working period with the incidence of pesticide toxicity in pesticide traders in Paser Regency, while the results of the study show that all respondents did not use personal protective equipment in a complete manner so that they were more at risk of experiencing pesticide toxicity. The need to conduct counseling or training for managers and workers at the pesticide sale sites on how to properly manage pesticides and mitigate the negative effects of hazards caused by pesticides which include the management of appropriate pesticides, the use of personal protective equipment, the practice of handling pesticides, health labor aspects, how to repack pesticides, work environment sanitation as well as ways of dealing with poisoning. As well as for traders to conduct medical check-up every 6 months and provide PPE for workers and themselves.

Ethical Clearance: This study approved ethical clearance from the Committee of Public Health Research Ethics of Medical Faculty, Lambung Mangkurat University, Indonesia. We followed guideline from Committee of Public Health Research Ethics of Medical Faculty, Lambung Mangkurat University, Indonesia for ethical clearance and informed consent. The informed consent included the research title, purpose, participants' right, confidentiality, and signature.

Source Funding: This study was done by self-funding from the authors.

Conflict of Interest: The authors declare that they have no conflict interests.

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