

The Influence Factor of Poisoning Pesticide on Onion Farmers in Nganjuk, East Java, Indonesia

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Abstract

The use of pesticides which did not qualify the regulation could cause poisoning. The aim of this study was to analyze the factor which influenced organophosphate of poisoning the pesticide on onion farmers in Nganjuk, East Java, Indonesia by using cross sectional design. 160 farmers were selected as the sample size by using simple random sampling technique. The collected data was analyzed by using Spearman Rho, Chi-square, Contingency coefficient, and ordinal regression. The result of Spearman Rho test was p -value = 0.882 (for the factor of working hours), p -value = 0.949 (for age factor), and p -value = 0.777 (for education factor). The result of Chi-square was p -value = 0.164 (for duration of exposure of pesticide spray), p -value = 0.244 (for pesticide active materials). The result of ordinal regression was p -value = 0.002 (for personal hygiene and the duration of exposure which caused poisoning). Furthermore, the farmers should use pesticide based on the proper regulation. In addition, health professionals periodically gave a seminar and medical check for them. Besides, the government also supervised them in the use of pesticide.

Key words: Farmers, pesticide poisoning, duration of exposure, personal hygiene.

I. INTRODUCTION

Pesticide was a chemical substance which was used to prevent or destroy the pests. Pest was organism that competed for getting foods, bothered the comfort, or endangered human health. Pest was as a pesticide target, including insects, fungi, mice, and larva.

Nowadays, the use of pesticide in Indonesia more increased than before. Most of the pesticides were used for eradicating pests and plant diseases, cleaning surroundings from the pests, preserving the building materials, destroying pests in warehouse, and etc. Indonesia as an agrarian country, thus, the agricultural sector became a mainstay sector here; and more than 40 millions of Indonesian people were as farmers.

One of districts in Indonesia that had more than 85% inhabitants as farmers was Nganjuk. They used pesticide by applying spraying method. Therefore, it could cause contamination through skin, inhalation, or absorption.

In many cases of poisoned pesticide, the most difficult part of causing contamination was spraying pesticide. The spraying pesticide that did not qualify the rule would cause many impacts, such as health effect for human being; the farmers were poisoned by the pesticide. In this part, when the farmers were spraying the pests, they must wear personal protective equipment (*Alat Pelindung Diri (APD)*), did spraying techniques well, and kept personal hygiene in order to avoid pest contamination. However, the farmers tended to regard it as trivial thing concerning with the dangerous pesticide, hence, they did not qualify the requirement of health and safety in using the pest, including the use of personal protective equipment and the technique of applying the spraying. The poisoning of pesticide that was not often felt and the consequence that was difficult to be predicted supported them to apply the pest in their own way because they were not felt to be bothered.

Based on previous research, onion farmers which were active in spraying pesticide, most of them had ever suffered the symptoms of poisoning pesticide, such as feeling weak, headache, queasy, sweating, even it made them vomit and collapsed. The use of pesticide gave negative effects for human being and the surroundings. It could cause the death for human, the diseases or physical defects. Wrong technique in spraying could cause the failure in controlling the organism and caused the poisoning as the impact of pest contamination on the farmers.

One of main factor in someone's exposure against chemical materials such as pesticide was the use of personal protective equipment. If the farmers did not wear it completely when they used the pesticide, they would be poisoned easily and fast⁴.

II. METHODS

This research aimed at analyzing the factors that influenced the poisoning of organophosphate pesticide on onion farmers in Nganjuk, East Java, Indonesia by using cross sectional design. The analyzed factors were age, the working period (year), education, the use of active materials, the duration of pest exposure, and personal hygiene. The sample size was 160 farmers who were active in doing spraying pesticide. They were chosen by using random

sampling technique. The data were collected through filling questionnaire. Then, it was analyzed by using Spearman Rho, Chi-square, coefficient contingency, and ordinal regression.

III. RESULTS

Table 1: Distribution of age, working period, education, the active materials of pesticide used by the farmer

Characteristic	n	%
Age (year)		
20-25	32	20
26-31	22	14
32-37	24	15
38-43	24	15
44-49	27	17
50-55	21	13
56-61	10	6
Working Period (year)		
2-7	30	19
8-13	27	17
14-19	21	13
20-25	24	15
26-31	26	16
32-37	13	8
38-43	11	7
44-49	8	5
Education		
Unschooling	16	10
Primary	42	26
Junior high	51	32
Senior high	43	27
University	8	5
Active Materials of Pesticide		
Tetraethylpyrophosphate	31	19
Chlorfenapyr	19	12
Abamectin	13	8
Dichlorvos	46	29
Acetate	21	13
Triazophos	19	12
Profenofos	11	7

Table 2. Distribution of personal hygiene, the duration of exposure, and poisoning as the impact of pest spraying

Characteristic	n	%
Personal Hygiene		
Good	32	20
Enough	78	49
Poor	50	31
The Duration of Exposure		
≥5 hours/a day	67	42
<5 hours/a day	93	58
Poisoning		
Minor poisoning	58	36
Medium poisoning	72	45
Chronic poisoning	30	19

The result of Spearman Rho test showed p-value was 0.370 (ages had no correlation with personal hygiene), p-value was 0.397 (the working period had no correlation with personal hygiene), p-value was 0.848 (education had no correlation with personal hygiene), p-value was 0.882 (working period had no correlation with pesticide poisoning), p-value was 0.949 (age had no correlation with pesticide poisoning), p-value was 0.777 (education had no correlation with pesticide poisoning). Then, the result of Chi-square pesticide showed p-value=0.678 (the active materials of pesticide had no correlation with pesticide poisoning), p-value=0.111 (working period had no correlation with duration of exposure), p-value=0.192 (age had no correlation with duration of exposure), p-

value=0.010 (education had correlated with duration of exposure), p-value=0.164 (duration of exposure of pesticide spraying had no correlation with poisoning), p-value=0.244 (active materials of pesticide had no correlation with poisoning). The result of Contingency Coefficient test showed p-value=0.310 which meant that active materials of pesticide had no correlation with duration of exposure of pesticide spraying.

The result of ordinal regression showed p-value=0.002 which meant that personal hygiene and duration of exposure influenced to the occurrence of poisoning the pesticide. The values of Pseudo R-Square were Cox and Snell was 0.125, Nagelkerke was 0.143, McFadden was 0.01165; and it proved that personal hygiene and duration of exposure which influenced the occurrence of poisoning for 14.3 % and 85.7 % that came from other factors. The parameter estimates showed the significant value of Statistic Wald of <0.05 and this meant that personal hygiene factor and the duration of exposure had the influence of poisoning as the result of pesticide spraying.

IV. DISCUSSION

a. Personal Hygiene

The research result showed that there was no correlation between personal hygiene and pesticide poisoning on onion farmers. Personal hygiene was the act to keep maintaining someone's cleanliness and health. It was for maintaining either psychological or physical prosperity. One of ways to prevent poisoning was keep maintaining the skin cleanliness. The farmers used pesticide continuously with high frequency without any paying attention to the ways and rules, such as the habit while eating and drinking without washing the hands with soap before. It could cause pesticide poisoning on the farmers. Poor personal hygiene could give the opportunity for pesticide to get inside in our body. Besides, when the farmers did not wash their hands before eating or drinking or smoking after spraying pesticide, it was probably that pesticide would get inside the body through their mouth. Then, when they did not take a shower after doing agricultural activities, the pesticide would get inside the body through the skin. That's why, it was important to keep the cleanliness, tidiness, and treatment for our body. Another important point was the workers must be healthy and safe in work places. Personal hygiene could prevent the spreading of microbes and diseases, decrease the spreading of chemical substance and its contamination, decrease skin allergy and sensitivity to chemical materials⁵.

The farmers did not wear personal protective equipment because they did not feel comfortable while wearing it. They only wore hat and long T-shirt to protect their selves from the sun. They often wore slight and torn mask as the replacement of hat and mask itself. There were also farmers who wore long arm T-shirt which was bind on their heads and covered their faces as the replacement of mask. Those cases could influence the exposure of pesticide to get inside through respiration (mouth and nose) or through skin (inhalation). They seldom wore gloves and glasses.

Moreover, the farmers were less paying attention to personal hygiene before and after pesticide spraying. This habit made them to ignore the personal protective equipment and smoke while spraying pesticide. When they stopped for a while to eat, drink and continued to spray again. They did not wash their hands with soap and clean water first. If the rice field was far from diesel, they used to wash their hands in the drain of rice field and flush it by using water that they brought. As the result, while they were eating, drinking, and smoking, they were still in dirty condition and did not wear clean-dressed yet. Concerning with those cases based on research⁶, it showed that there was a significant correlation between eating and drinking when they stopped spraying and the pesticide poisoning. However, it was important to pay more attention of occupational health and safety rules. The completeness of wearing personal protective equipment and changing clothes after spraying could reduce the risk of poisoning the pesticide.

All in all, in reducing pest exposure, it was needed to pay more attention the occupational safety rules, such as while having contact with pesticide, they were not allowed to eat, drink, or smoke⁷.

b. The Duration of Exposure

The result of this research showed that there was no significant correlation between the duration of exposure of pesticides spraying and the poisoning on onion farmer. The farmer did the spraying in more than in equal with 5 hours/day. This was due to the land that was owned by the farmer in average was almost 1 Ha, hence, the farmer cultivated the field by self, and it was started from spraying, watering in the morning and afternoon, and cleaning the grass self. Therefore, their job was started from in the morning until the noon, and then, it was continued again in the afternoon. Most of their activity was spent in the field for caring their onion that they planted. If the pest attack increased, almost all farmers everyday did pesticide spraying. Most of them did that, started from in the morning until in the noon without noticing the time and the duration of the exposure of pesticide spraying. Whereas, generally, it was suggested for the good time in doing pesticide spraying was in the morning at 07.00-10.00 and in the afternoon at 15.00-18.00⁷. One of the factors from the outside of the body that influenced

poisoning on the farmer was the exposure duration of pesticide spray.⁴ The exposure duration was the long of time that was needed for working with pesticides, meanwhile, the frequency of spraying was how many times to do pesticide spraying. The longer the work time that was used and the more times the pesticide spray, the bigger the farmer to be exposed by pesticides. Farmers who worked in quite long time with pesticide, they would suffer chronic poisoning. It meant that the longer the farmer worked, the more number the pesticides which were absorbed and it could cause the decrease of cholinesterase activity and working period could be explained specifically based on the duration of the exposure.

The absorption of poisonous substance was really depended on the duration of body surface that was exposed or having contact with poisonous substances. If somebody had a contact with poisonous substance in his/her job, they would have clear influence toward the absorption of the substance. If there was a contact with toxic substances, it would not only cause the local effect in working place, but also the damage if it was absorbed by the body. The absorption could be occurred through the skin, digestive tract, and respiratory tract⁸.

Education was one of the indicators in Human Development Index that was developed by the Development of the United Nations (*Badan Pembangunan Perserikatan Bangsa-Bangsa (UNDP)*) because it could form the quality of human's life and if it was not fulfilled, it would cause a problem in society. Education aimed at fighting a stupidity. The society who had high education could influence in improving the ability of caring and improving health. The education level in society that was counted from the average duration in studying a school became a requirement for public health degree either directly or indirectly.⁹

The low education level of the farmers could become an influence toward knowledge level against the handling and the use of pesticide. The knowledge about an action before doing a spray, including: the use of regulation that was appropriate with the label, the way in mixing, the action after spraying based on the appointment. The three things could reduce the poisoning on the farmers¹⁰

c. Poisoning due to Pesticide Spraying

Based on the result of this research in field, many farmers suffered either medium poisoning or chronic poisoning. The farmers would complaint of having headache, vomiting, watery eyes, blurred vision, sweating, muscle ache, and tremor suddenly after doing pesticide spraying. The complaints were because the farmers did not pay more attention about the appropriate procedures of the spray, such as: personal cleanliness (as using complete personal protective equipment and the correct technique in spraying. Moreover, many farmers did the spray inappropriately with the wind direction and blew the clogged nozzle with his/her mouth directly. Besides, the farmer often brought food and drink by self from his/her home. The space-time among the sprays or finished spraying, they usually ate "packed meal" that they brought from their home. This could influence farmer's health status due to the less someone's cleanliness and hygiene. They only washed their hands in the rice field with the water which was available there and unclean water without using any soaps. The farmers always considered trivial those, whereas, those could make the farmer's health and safety dangerous.

Poisoning pesticide could be occurred due to the entry of pesticide much over or because they were trivial the procedures of occupational health and safety and inadequate occupational equipment.¹¹

Organophosphate was chemical substance that was synthesized based on basic structure. The first organophosphate that was synthesized based on this lead-structur was sulfotep in 1944. Organophosphate was known as very toxic (dangerous) pesticide group although in pesticide package was shown the note of contained active substances. Hence, it had stronger odor to be smelled. Pesticide workers or farmers who were the user of pesticide would suffer dizzy and vomit if they smelled out the pesticide odor with high active substance.³

d. Factors that Influenced the Poisoning Pesticide

Based on the result of regression analysis of ordinal showed personal hygiene and the duration of the exposure influenced the poisoning due to pesticide spraying on onion farmers with p value $0,002 < 0,05$. This showed that there was a significant influence between personal hygiene and the duration of exposure against the poisoning as an impact of pesticide spraying on farmer.

The correlation between personal hygiene and poisoning was known that most of the farmers had personal hygiene in category of enough and suffered minor poisoning.

Personal hygiene in order to reduce risk of poisoning was they had to do all complete and correct processes so that the residue from the pesticide did not stick in either their body or their clothes that could cause the symptoms of poisoning. The result of this research was appropriate with previous research that in order to reduce risk of the

symptoms of chronic poisoning, they had to do complete all steps from either washing hands with the soaps and clean water before and after concocting the pest spraying, taking bath, or changing clothes¹².

While conducting this research, the field condition was being occurred pest attack that increased. The farmer tried hard to save the plants so that they would not fail the harvest. Until the researcher found that, many farmers stated they took bath with pest medicine every day because every day, the farmer had to do pest spraying for destroying the germ. Due to limited knowledge, it was only obtained from worse environment and worse farmer's habit, the condition such that, the farmer still did not notice of their health and safety, and still conducted the spray that was not appropriate with procedures, hence, it could make the farmer would often undergo complaints without they knew and realize before and the complaints were the symptoms of pest poisoning.

V. CONCLUSION AND SUGGESTION

The occurrence of pesticide poisoning on onion farmers in Nganjuk, East Java, Indonesia, was influenced by the factor of personal hygiene and the duration of pesticide exposure. Next, it was suggested for the farmers to use pesticide in correct rules. Besides, the health professionals should do a seminar and medical check for the farmers periodically and the government should give supervision in using the pest.

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Komite Etik Penelitian Kesehatan STIKes Surya Mitra Husada dalam upaya melindungi hak asasi dan kesejahteraan subyek penelitian kesehatan, telah mengkaji dengan teliti protokol berjudul :

Health Research Ethics Committee STIKes Surya Mitra Husada in the effort to protect the rights and welfare of research subjects of health, has reviewed carefully the protocol entitled:

**“The Influence Factor of Poisoning Pesticide on Onion Farmers in
Nganjuk, East Java, Indonesia“**

Peneliti Utama : Dr. Indasah, Ir.,M.Kes

Principal Investigator

Nama Institusi : STIKes Surya Mitra Husada

Name of Institution

Dan telah menyetujui protokol tersebut di atas.

And approved the above-mentioned protocol.

Kediri, 10 Mei 2017

KETUA

KOMISI ETIK PENELITIAN KESEHATAN
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