Use of Pesticides and Pesticides Poisoning to Farmers in Juhar Ginting Sadanioga Village, Karo Regency

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Indonesia is an agricultural country where most of the people work as farmers and still use pesticides to increase their agricultural output. The purpose of this study was to analyze the use of pesticides and pesticide poisoning to farmers in JuharGintingSadanioga Village, Indonesia. This research uses a cross-sectional design. The number of samples of this research were 35 spraying farmers, using simple random sampling technique. Data were collected by interview using a questionnaire and indicators of pesticide poisoning seen from the examination of cholinesterase levels in the blood with a tintometer kit. The data were analyzed using the Pearson correlation test and the Spearman correlation test. Mean of working period the farmers is 23.2 years, mean of spraying time the farmers is 4.31 hours/day, mean of last spraying time is 5.86 day, and mean of cholinesterase level is 7.417,03 U/l, There was a significant correlation between work period and pesticide poisoning (p=0.019, r=0.394), the time of spraying and pesticide poisoning (p=0.0001, r=0.752), spraying time and pesticide poisoning (p=0.034, r=-0.360). There is a significant correlation between work period and pesticide poisoning (r=0.394), the time of spraying and pesticide poisoning (r=0.752), spraying time and pesticide poisoning (r=-0.360) in farmers in JuharGintingSadanioga village.

Keywords: Poisoning, Pesticides, Farmers, Spraying, Cholinesterase

INTRODUCTION

Pesticides are toxic chemicals that function to eradicate plant-destroying organisms, destroy agricultural products, eradicate weeds, destroy unwanted growth, regulate or stimulate the growth of certain plant parts (not a fertilizer), eradicate or prevent external pests, in domestic animals and livestock, wiping out aquatic animals, eradicating animals and destructive microorganisms in households, buildings, and in transportation equipment, eradicating vector and weed organisms (Minister of Agriculture Regulation No.39, 2015).

World Health Organization (2017) estimates that in countries that are trying to become large there are approximately 3 million people whose activities in agriculture have been exposed to poisons from substances contained in chemical pesticides and each year around 18 thousand of them die. Since the middle of the last century, pesticides have been an important component of world efforts to increase agricultural output and reduce vector-borne diseases. Pesticides provide great benefits for agriculture. However, the costs and impacts of their use are often a matter of debate.

Konradsen et al. (2005) estimated that more than 3 million people are hospitalized due to pesticide poisoning every year and 220,000 die. Recent studies from Asia show that as many as 300,000 deaths from pesticide poisoning can occur in the Asia-Pacific Region every year. The easy availability of pesticides and unsafe storage of pesticides has fatal and sometimes unintentional consequences (Eddleston et al., 2004).
According to Hohenadel (2011), pesticide exposure is determined by many factors such as the dose of pesticides, exposure time and exposure modification factors such as the use of personal protective equipment. The use of pesticides in high doses and the long run can have negative impacts on society such as pesticide poisoning. Pesticide poisoning is various, namely acute and chronic with a variety of effects that can be caused, ranging from feeling nauseous, vomiting, and dizziness to death. Pesticide poisoning can be found in the human body through an examination of the level of cholinesterase in the blood (Saputri et al., 2018).

The people of JuharGintingSadanioga Village are groups of people who are at risk of suffering from pesticide poisoning because according to information from the Karo Regency Statistics Agency (2017), the total working population is 864 people with 765 people working as farmers or around 88.54% of the population working. The plants that are cultivated in this area are corn, rice, cucumber, string beans, tomatoes, and chili. Then, all farmers still use pesticides to increase their crop productivity. According to preliminary survey results, it is known that the community has been working as farmers for around 20-30 years with a spraying time of around 2-10 hours / day. The dosage of pesticides used when spraying is 10-20 tanks/day or around 20L / day -40L / day. The time of spraying is done every two days starting in the morning at 08.00 WIB and ending at 13.00 WIB and if the spraying of the plant has not been completed then spraying continues at 14.00 WIB and finishes at 17.00 WIB. Then, in spraying, no-one farmers used masks and headgear when working because they were uncomfortable and not used to it. Farmers only wear long-sleeved shirts, long pants, and cloth shoes when spraying. Farmers also do not know that the pesticides they use are very dangerous and can cause various health problems because farmers never get information from anywhere about the dangers of using pesticides. Besides, farmers also claim to have never been examined their health conditions related to exposure to pesticides including the level of pesticide poisoning in the blood. Therefore, this research aims to analyze the use of pesticides and pesticide poisoning in farmers in JuharGintingSadanioga Village.

**METHOD AND SAMPLES**

This research uses a cross-sectional design with a total sample of 35 spraying farmers. This research was conducted in JuharGintingSadanioga Village, Karo Regency, North Sumatra in 2019. The sampling technique used was Simple Random Sampling technique. Farmers who are the subject of this research are farmers who have worked as spraying farmers for at least 1 year, are still actively spraying, and spraying for the past 2 weeks. The independent variables of this research are the working period, the length of spraying, and the last time spraying. The dependent variable of this research is pesticide poisoning. Data were collected by interview using a questionnaire and checking the level of cholinesterase in the blood with a tintometer kit. Then, the data were analyzed using the Pearson correlation test and the Spearman correlation test. Statistical analysis used SPSS V 15.0 for Windows Evaluation Version.

**RESULTS**

The results of this research are:

1. **Univariate Analysis**

The results of the univariate analysis of this research variable are explained in the following table:

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean±SD</th>
<th>Min-Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Working Period (year)</td>
<td>23.2±9.94</td>
<td>5-50</td>
</tr>
<tr>
<td>Spraying Time (hour/day)</td>
<td>4.31±2.044</td>
<td>2-9</td>
</tr>
<tr>
<td>Last Spraying Time (day)</td>
<td>5.86±3.107</td>
<td>1-12</td>
</tr>
<tr>
<td>Cholinesterase Level (U/l)</td>
<td>7.417,03±1.360,216</td>
<td>4.996-11.120</td>
</tr>
</tbody>
</table>

Table 1 shows that of the 35 respondents, the average length of service of respondents were 23.2 years with a minimum service period of 5 years and a maximum service period of 50 years. The spraying time variable shows that of 35 respondents, the average spraying rate was 4.31 hours/day with a minimum spraying time was 2 hours/day and the maximum spraying time was 9 hours / day. The cholinesterase level variable shows that of 35 respondents, the average cholinesterase level of the farmer was 7.417.03 U / l with a minimum cholinesterase level of 4.996 U / l and the maximum cholinesterase level was 11.120 U / l. The last spraying time variable shows that of the 35 respondents, the average spraying time was 5.86 days before the cholinesterase level examination with the minimum time is 1 day before the cholinesterase level examination and the maximum time was 12 days before the cholinesterase level examination.

2. **Bivariate Analysis**

The results of the bivariate analysis in this research are shown in table 2.

Table 2 shows that the length of service variable has a value of p = 0.019, it means that the correlation of work period and pesticide poisoning is significant with a Pearson correlation value of 0.394 which shows a positive
correlation with the strength of the correlation that is not too strong. Then, the last time spraying variable has a value of \( p = 0.0001 \), it means that the correlation of the time of the last spraying and pesticide poisoning is significant with a Pearson a correlation value of 0.752 which shows a positive correlation with a very strong correlation strength.

**Table 2.** Results of Pearson Correlation Analysis of Working Period and Last Time of Spraying and Pesticide Poisoning

<table>
<thead>
<tr>
<th>Variable</th>
<th>Pesticide Poisoning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Working Period</td>
<td>( r \quad 0.394 )</td>
</tr>
<tr>
<td>Last Spraying Time</td>
<td>( r \quad 0.752 )</td>
</tr>
</tbody>
</table>

Table 3 shows that the spraying time variable has a value of \( p = 0.034 \), it means that the correlation of spraying time and pesticide poisoning is significant with a Pearson correlation value of -0.360 which shows a negative correlation with a correlation strength that is not too strong.

**DISCUSSION**

This research discusses the use of pesticides and pesticide poisoning in farmers in JuharGintingSadanioga Village in 2018.

1. **Working Period and Pesticide Poisoning for Farmers in JuharGintingSadanioga Village, Karo Regency in 2018.**

The results of the analysis showed that the variable of working period value of \( p = 0.019 \). It means that the correlation of work time and pesticide poisoning is significant with a Pearson correlation value of 0.394 which shows a positive correlation with the strength of the correlation that is not too strong.

Working period is the length of time the respondent works as a spraying farmer in units of years, which means how many years the farmers have been spraying using pesticides and being exposed to pesticides. Farmers in JuharGintingSadanioga Village have worked as spraying farmers for more than 5 years and most of them have been spraying for decades. This is certainly very risky because the exposure has been going on for a long time. Exposure to pesticides in a long time will cause the accumulation of harmful chemicals in the body and cause interference with the body, poisoning, and even death. This result is in line with several other studies, which was the research of Osang et al. (2016) which states that there is a significant relationship between working period and blood cholinesterase levels. The working period of rice farmers who have been increasingly poisoned due to longer exposure to pesticides, so that the amount of toxic pesticides that enter the body accumulates and will affect the health of farmers, with the impact of poisoning that will slowly be felt by farmers.

There is also research from Patras (2013) which found that there was a significant correlation of the length of work and the levels of vegetable farmers' cholinesterase in Tomohon City. Prasetya et al. (2010) explained that there was a significant relationship between working period and cholinesterase levels. If the farmer's working period is longer, then the level of cholinesterase will also be lower, and the higher the risk of poisoning so that the more amount of toxic substances that enter the body.

According to the results of interviews with respondents regarding complaints of health problems obtained information that most of the respondents have complaints of health problems in recent years such as hypertension, anemia, and some are suffering from diabetes mellitus. Besides, some farmers also experienced complaints of other health problems such as dermatitis, fatigue, weakness, and headaches after spraying. Some of these complaints are symptoms of pesticide poisoning which is feared that if left for a long time will have a worse impact on the health of farmers. Chronic health problems that can occur due to exposure to pesticides are damage or disorders of red blood cells and damage to organs or tissues such as reproductive organs, pancreatic damage, and parkinsonism (Achmadi, 2014).

2. **Last Spraying Time and Pesticide Poisoning to Farmers in JuharGintingSadanioga Village, Karo Regency in 2018.**

The results of the analysis show that the last spraying time variable has a value of \( p = 0.0001 \). It means that the correlation between the last time spraying and pesticide poisoning is significant with a Pearson correlation value of 0.752 which shows a positive correlation with a very strong correlation strength.

Most respondents use organophosphate pesticides. Then, all respondents had the last spraying time less than 2 weeks. This condition has an impact on the level of cholinesterase in farmers' blood which is decreased when the cholinesterase levels. The working period of rice farmers who have been increasingly poisoned due to longer exposure to pesticides, so that the amount of toxic pesticides that enter the body accumulates and will affect the health of farmers, with the impact of poisoning that will slowly be felt by farmers.

Organophosphate and carbamate pesticides are chemical compounds classified as anticholinesterase. In the
human body, acetylcholine and cholinesterase are produced. The cholinesterase enzyme functions to break acetylcholine into choline and acetic acid. Acetylcholine acts as a crossing bridge for the flow of nerve vibrations. With the help of the nervous system, the organs in the body get information to increase or decrease cell effectiveness. In the nervous system, the stimulus obtained is sent through axons in the form of impulses / stimuli. After nerve impulses are transmitted by acetylcolyn through the fibers, the enzyme cholinesterase breaks down acetylcholine by meghidrolisis acetylcholine into choline and acetic acid. Then, nerve impulses stop. These chemical reactions take place very quickly. When organophosphates enter the human or animal body, pesticides bind to the enzyme cholinesterase. Cholinesterase cannot break acetylcholine so that nerve impulses flow constantly and cause a rapid twiching of muscles and end in paralysis (Prijanto, 2009).

According to several studies (Cova et al., 1990; Ali and Jain, 1998), pesticides can damage the central nervous system and cause impaired liver function and interfere with enzyme activity in the human body that results in the emergence of various diseases such as the disruption of the cholinesterase enzyme system which results in damage to pancreatic organs and others.

According to Suryamah (2006) in Rustia (2010), it was found that farmers who made last contact ≤2 weeks had a risk of 5.8 times to experience poisoning compared to farmers who made last contact> 2 weeks ago. This is in line with research Prijanto (2009), pesticide poisoning due to a decrease in the activity of the enzyme cholinesterase in blood plasma will occur when a person starts to be exposed for up to 2 weeks after spraying. Therefore, the recovery process for farmers who have been diagnosed with pesticide poisoning is to rest farmers from spraying activities for 2 weeks to increase the level of cholinesterase in their blood. If exposure occurs continuously, it is feared this could cause symptoms of more severe poisoning or cause chronic effects in the future. Insecticide's exposure in high concentrations after several months of exposure can have an effect on nerve, cognitive, and neuromuscular function, as well as damage to other neurological organs, causing coma in the absence of reflexes, and tremors (Klaassen, 2003).


The analysis shows that the spraying time variable has a p-value = 0.034. It means that the correlation of spraying time and pesticide poisoning is significant with a Pearson correlation value of -0.360 which shows a negative correlation with a correlation strength that is not too strong.

Spraying time is the length of time that a farmer needs to spray plants using pesticides in units of hours each day. The duration of spraying is the length of work per day. According to the results of the interview, it was obtained that respondents frequently sprayed more than 4 hours/day and in general, respondents sprayed plants for more than 2 hours/day because the area of land to be sprayed was quite extensive while the spraying process had to be completed at the same time is one day to avoid pest resistance. Therefore, spraying time has a significant correlation with pesticide poisoning.

This is in line with the research of Sungkawa (2008), which stated that the longer time farmers spend to spray shows the higher levels of exposure to pesticides. One should not spray for more than 2 hours every day because of the longer the spraying, the higher intensity of exposure that occurs. Suparti et al. (2016) mentioned that the habit of farmers who sprayed for more than two hours in their research proved to be a risk factor for organophosphate pesticide poisoning with a risk of 5,604 times compared to farmers who sprayed for less than two hours per day. Then, according to Hongsibsong et al. (2018), cholinesterase activity in the blood has a significant correlation with spraying. Spraying can indicate a decrease of cholinesterase activity in the body. Spraying time > 3 hours is a risk factor that has a significant relationship to pesticide poisoning, which is spraying time > 3 hours has an 11 times risk of pesticide poisoning compared to farmers with a good spraying time or <3 hours. According to Kachaiyaphum et al. (2010), there is a correlation between spraying pesticides more than 3 times a month with serum levels of cholinesterase in the blood (SChE) of chili farmers in Thailand. According to him, continuous monitoring of cholinesterase levels needs to be done. Exposure of pesticides rarely has a significant direct impact on the the human body and does not cause sudden pain. However, pesticide compounds will accumulate in the body for a long time for several months or several years ahead and eventually until the farmers experience chronic poisoning (Lpmawati et al., 2016).

CONCLUSION

1. There was a significant correlation of the working period and pesticide poisoning in farmers in JuharGintingSadanioga Village, Karo Regency (p = 0.019, r=0.394), which shows a positive correlation with a correlation strength that is not too strong.
2. There was a significant correlation of the last spraying time and pesticide poisoning in farmers in JuharGintingSadanioga Village, Karo Regency (p = 0.0001, r=0.752), which shows a positive correlation with the strength of a very strong correlation.
3. There was a significant correlation of spraying time and pesticide poisoning in farmers in JuharGintingSadanioga Village, Karo Regency (p = 0.034, r = -0.360), which showed a negative correlation with a correlation strength that was not too strong.
SUGGESTION

1. Health workers at the Juhaar Community Health Center are expected to establish a program of assistance and periodic inspection of pesticide poisoning for farmers considering that the majority of Juhaar-Ginting Sadanioga villagers works as farmers who are continuously exposed to the risk of pesticide poisoning.

2. The farmers are expected to not spray more than 2 hours/day to reduce the excessive exposure to pesticide chemicals so that normal levels of cholinesterase in the blood.

REFERENCES


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