

History of Exposure to Pesticides with Symptoms of Poisoning in Children in Agricultural Areas; Case-Control Study in West Seram Regency

Ilyas Ibrahim^{1*}, Sahrir Sillehu²

^{1,2}Institute of Health Science of Maluku Husada, Indonesia

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ABSTRACT

The high use of pesticides can cause environmental pollution, poisoning and accumulate in agricultural products, resulting in a negative impact on public health. Pesticides attack the nervous system, liver, immune system and balance hormonal disturbances that interfere with the growth and development of children. Children are a group at risk of exposure to pesticides because they participate in agricultural activities and live near agricultural areas. The purpose of this study was to analyse the history of exposure to pesticides with symptoms of poisoning in elementary school children in agricultural areas. This type of research is analytic observational with a case-control study design. The study involved 90 elementary school children who were taken using inclusion criteria based on their area of residence. There are 90 children living in agricultural areas. Collecting data using a questionnaire, observation and health examination. Data analysis used the Chi-square test to see the proportion and relationship of variables. The results showed that there was a relationship between children's involvement in cleaning vegetables ($p=0.01$; $OR=3.89$), tying vegetables ($p=0.037$; $OR=4.74$), and children's personal hygiene after playing ($p=0.04$; $OR=3.06$) which significantly increased risk of exposure to pesticides with symptoms of poisoning. Conclusion; There is a relationship between history of exposure to pesticides and symptoms of poisoning in children.

Keywords: exposure to pesticides, symptoms of poisoning, children, agriculture

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***Correspondence:** Dr. ilyas ibrahim (Email: ilyasibrahim.f6@gmail.com)

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INTRODUCTION

Pesticides are chemical substances that function to control various pests. Pesticides not only provide positive benefits to agriculture, but also have negative impacts on the environment and public health. The bad effects of pesticides do not only affect farmers or workers who spray pesticides, but can also affect families and neighbours where these activities are carried out.¹

Exposure to acute pesticides in certain doses can cause poisoning. One of the groups at risk of exposure to pesticides is children who live in agricultural areas because of their involvement in agricultural activities and their habit of playing in an environment that has been contaminated with pesticides.

Pesticide poisoning is especially dangerous for children, who are in the early critical stages of developing the brain and nervous system, because their bodies are still in their infancy. Children have natural defences that are more vulnerable and can develop more serious effects if they are exposed to pesticides intensely.²

The results of research at an elementary school in the shallot farming area of Brebes Regency showed that 81.3 percent of students were involved in agricultural activities with the types of activities including looking for pests, helping during harvesting and removing onions from the stalks.³

Children who live in agricultural areas have a higher risk of being exposed to pesticides. The results of a survey in the agricultural area of western Seram showed that children were often involved in agricultural activities including clearing farmland, clearing pests on plants, participating in harvesting vegetables, cleaning vegetables, tying vegetables, and looking for crop residues in the fields, besides playing in agricultural area. These activities make children experience direct contact with pesticide residues found in soil and plants.

The negative effects of exposure to pesticides in groups of children can cause various health problems. According to Suhartono's research, it was stated that the results of examinations on elementary school children in the Brebes agricultural area, out of 66 children, 15 positive children were detected having metabolism of organophosphate pesticides in the urine and experiencing hypothyroidism with a prevalence rate of 67% higher than children who were negative.⁴ This is related to the history of children involved in agricultural activities.

Alim, research on 94 children in Banjarnegar showed that a history of exposure to pesticides with OR=4.21 times was the dominant risk factor for stunting in children aged 2-5 years. This research proves that children who are often involved in agricultural areas are very vulnerable to exposure to pesticides and are at risk of stunting.⁵

West Seram Regency has a fairly large agricultural area and is a supplier of vegetables to almost all markets in the cities of Ambon and Seram. The use of pesticides in this region is quite high due to the pursuit of agricultural production targets to meet market demand. so that children easily come into direct contact with pesticides in the agricultural area. The results of Rumaru's 2019 research on the analysis of pesticide residues found that pesticide residues in kale and spinach exceeded the maximum residue limit (BMR) in Waimital Village, Kairatu sub-district, West Seram Regency. This shows that the use of pesticides in the Maluku region is quite high.⁶

The habit that often occurs in agricultural areas is that parents often invite their children to be involved in agricultural activities and play without paying attention to the bad effects of pesticides. The high agricultural production in West Seram followed by the use of pesticides which is quite high can pollute the environment, especially children who are often involved in agricultural activities so it is necessary to conduct this research with the aim of analysing the history of exposure to pesticides with symptoms of poisoning in children in agricultural areas.

METHODOLOGY

This was an analytic observational study using a case control design. The study aimed to analyse the relationship between a history of exposure to pesticides and symptoms of poisoning in children in agricultural areas. The study was conducted by determining the case and control groups, which were assessed retrospectively for pesticide exposure. This study involved 90 respondents, consisting of 45 cases and 45 controls. The inclusion of these respondents was based on their place of residence and medical history related to symptoms of pesticide poisoning. Purposive sampling was done to select participants.

The case group and control group included children who lived in agricultural areas, had parents working as farmers, or had been involved in agricultural activities. Cases were children who had a medical history related to symptoms of pesticide poisoning, and controls were children who had no medical history related to symptoms of pesticide poisoning. Thus, the case and control groups were separated based on the retrospective symptoms of poisoning. The variables measured were the history of exposure to pesticides experienced by children in agricultural areas and the symptoms of poisoning caused by pesticides. Data collection was carried out using questionnaires and field observation checklists. The collected data were analysed using the SPSS 25 application. The Chi-Square test was used to compare the proportions of the two groups, the strength of the relationship, and the level of risk of exposure to pesticides.

This study received ethical approval with number No.RK.051/KEPK/STIK/1/2023 from the College of Health Science, Maluku Husada.

RESULTS

This research was conducted in the western Seram agricultural area in February 2023. This study involved elementary school children aged between 8 and 9 years with a case-control study design. The case group consists of children who live in agricultural areas, have parents who work as farmers, were involved in any agricultural activities, and have a medical history of symptoms of pesticide poisoning. While the control group children lived in the same area but did not have a medical history related to pesticide poisoning, Personal hygiene after playing was assessed by means of self-cleaning efforts such as bathing with soap, changing clean clothes, using clean footwear, cutting nails, and brushing teeth. Personal hygiene in agriculture was assessed by means of efforts to prevent exposure to pesticides by wearing long sleeves, long pants, masks, gloves, hats, and shoes. Involvement in cleaning vegetables was assessed by children's activities to help wash, remove dirt, and clean insects from vegetables. The habit of playing in agricultural areas was assessed by taking a history of routine activities that were often carried out by children in agricultural areas, such as playing boats in irrigation water, flying kites, playing with toy cars, shooting, and chasing. Involvement in cleaning spraying equipment was assessed by children's activities to help clean spraying equipment,

such as cleaning residual pesticides in tank containers, cleaning buckets for mixing pesticides, washing sprayer nozzles, and repairing spraying equipment. Involvement in cleaning the agricultural area was assessed by children's activities in cleaning the area, such as pulling grass, chopping wood, straightening soil beds, making drains, burning grass, and cleaning up trash. Involvement in tying up harvested vegetables was assessed by children's activities involved in preparing vegetables for sale, such as arranging vegetables, selecting vegetables, moving vegetables, and tying vegetables. Eating without washing hands is when children do not wash their hands using soap and water before eating.

Table 1 shows that the history of children involved in cleaning vegetables that may have been contaminated with pesticide residues was very significant with symptoms of pesticide poisoning with a p-value of 0.001, and the proportion of children involved in cleaning vegetables in the case group was 64.1% compared to the control group's 31.4%, and the OR is 3.89, which indicates the level of risk of exposure to pesticides. Personal hygiene after playing has a significant p-value of 0.04 with a proportion of 60.5% in the case group compared to 33.3% in the control group, and the OR is 3.06. Involvement in tying up vegetables yields a significance p-value of 0.037 with a case group proportion of 30.8 % compared to the control group's 8.6% and an OR of 4.74.

Table 1: Distribution of the results of the analysis of history of exposure to pesticides with symptoms of poisoning in children

Risk Factors	Case (%)	Control (%)	p-value	OR	95%
Personal hygiene after playing					
Not Good	34(75,6)	30(66,7)	0,04*	3,06	1,15-8,11
Good	11(24,4)	15(33,3)			
Personal hygiene in agriculture					
Not Good	39(86,7)	32(71,1)	0,59	0,51	0,11-2,24
Good	6(13,3)	13(28,9)			
Involved in cleaning vegetables					
Yes	31(68,9)	11(24,4)	0,01*	3,89	1,4-10,2
No	14(31,1)	34(75,6)			
Habit of playing in the agricultural area					
Yes	14(31,1)	10(22,2)	0,67	1,4	0,52-3,7
No	31(68,9)	35(77,8)			
Involvement cleaning spraying equipment					
Yes	37(79,5)	4 (8,9	0,458	0,5	0,13-1,83
No	8(20,5)	41(91,1)			
Involvement in cleaning the agricultural area					
Yes	39(86,7)	8(17,8)	0,602	0,61	0,19-1,98
No	6(13,3)	37(82,2)			
Involvement in tying up the harvested vegetables					
Yes	12(26,7)	3(6,7)	0,037*	4,74	1,2-18,5
No	33(73,3)	42(93,3)			
Eating without washing hands					
Yes	38(84,4)	33(73,3)	0,302	1,97	0,69-5,6
No	7(15,6)	12(26,7)			

DISCUSSION

Intense use of pesticides and not paying attention to the standards of their use can have negative effects

on the environment and public health. Exposed pesticides will enter through several routes: first, through the skin, where pesticide residues in liquid form will be more easily absorbed through the pores

of the skin and enter the body quickly. This skin pathway is almost 90% more effective than other routes. Second, pesticides enter through the respiratory tract; when spraying in a situation against the wind, pesticides will be inhaled through the nose and into the lungs.⁷ Third, pesticides enter through the digestive tract; food and drinks that have been contaminated with pesticides.

Therefore, children will be easily exposed to pesticides if they are involved in agricultural activities and play in agricultural areas. Pesticides are carcinogenic, mutagenic, and neurotoxic substances that have adverse health effects, including difficulty breathing, headaches, vomiting, diarrhoea, neurological or psychological effects, skin irritation, endocrine system disorders, reproductive system disorders, genetic disorders, and death.⁸

The involvement of children in the management of agricultural products causes them to be exposed to pesticides, for example, when farmers are spraying in the fields and children are drying onions or tying vegetables. In this study, the personal hygiene variable has a significant relationship, meaning that children who pay less attention to the cleanliness of their bodies or clothes will be more easily exposed to pesticides. This is in line with Dinia's research, which shows that poor child personal hygiene will provide opportunities for direct contact with pesticides so that pesticides enter the body. Eating or drinking after playing and being involved in agricultural activities without washing hands first will allow pesticides to enter the body through the mouth. Besides that, wearing clothes that have been contaminated with pesticides while playing will make it easier for children to be contaminated with pesticides.⁹

The results of this study illustrate that children's involvement in agricultural activities is very vulnerable to exposure to pesticides because almost all objects or soil around them are contaminated with pesticide residues. This is in line with Narwanti's research, which shows that the longer children play and are involved in agricultural activities, the longer they are exposed to pesticide residues found in soil, dust, and agricultural crops, and more and more pesticide residues contaminate the skin.¹⁰

The variables of children's involvement in cleaning and binding vegetables also have a significant relationship with poisoning symptoms. The results of this study are in line with Ibrahim's research in that the results of his research showed that children who were involved in the activities of removing the onion skins from the stalks, drying the onions, cleaning the onions, tying the onions, and looking for the rest of the onion harvest were exposed to pesticide residues from the soil, leaves, onion stalks, and onion skins.

If pesticide contact with the body is longer, it will be more dangerous for the body, so the most important thing to do is to maintain cleanliness and remove any remaining pesticide residues which may be carried

or attached to the body surface or mucosa. So, people engaged in farming activities can reduce poisoning by practicing good personal hygiene, such as washing hands with soap and bathing, change clothes, and avoiding eating or drinking immediately after playing or without proper hand washing.

CONCLUSION

Children who have a history of exposure to pesticides through their involvement in agricultural activities such as tying vegetables, cleaning vegetables, and poor personal hygiene have a significant relationship with the symptoms of pesticide poisoning.

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