Asian Journal of Healthy and Science
p-ISSN: 2980-4302
e-ISSN: 2980-4310
Vol. 1 No. 3 Desember 3, 2022

EVALUATION OF CHOLINESTERASE LEVELS IN VEGETABLE FARMERS IN PEKANBARU

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Abstract

Pesticides are chemical substances to control and eradicate pests. However, pesticide residues hurt farmers indirectly. The level of pesticide poisoning in the body can be known by examining cholinesterase levels. This study aims to determine cholinesterase levels in the blood of vegetable farmers on Jalan Kartama, Pekanbaru City. The sampling technique used in this research is purposive sampling. The method used in this research is. The results of the examination showed that from 20 serum samples from farmers, 11 people (55%) had cholinesterase levels according to reference values (not poisoned) and 9 people (45%) had mild poisoning. Other factors that can cause a decrease in cholinesterase levels in the body are working period ≥ 5 years, spraying pesticides against the wind and using incomplete Personal Protective Equipment (PPE). Cholinesterase levels in the blood of vegetable farmers in Pekanbaru City using a UV-Vis Spectrophotometer out of 20 serum samples examined, 9 farmers experienced mild poisoning and 11 farmers had cholinesterase levels according to the reference (non-poisoned). Therefore, vegetable farmers are expected to wear complete Personal Protective Equipment (PPE) when spraying pesticides and spraying in the direction of the wind.

Keywords: cholinesterase, farmers, vegetables, PPE.

INTRODUCTION

Farmers use pesticides to eradicate plant-disturbing pests (Sari *et al.*, 2018). However, farmers generally do not comply with the rules for using pesticides. The use of pesticides utilizing a *cover blanket*, where the plants are still sprayed with pesticides even though the pests are not present, is considered to be able to control the pests (Sari *et al.*, 2018). The use of pesticides that are not by the regulations will have direct and indirect impacts on farmers (Sari *et al.*, 2018). Farmers are exposed to pesticides through the processes of absorption, inhalation, and ingestion (Sari *et al.*, 2018). Poisoning that occurs as a result of exposure to pesticides can be identified by examining the activity of the cholinesterase enzyme in blood serum (Sari *et al.*, 2018). Organophosphate and carbamate pesticides can inhibit the activity of the cholinesterase enzyme in hydrolyzing acetylcholine so that acetylcholine will accumulate. Acetylcholine accumulation will result in nervous system disorders and symptoms of poisoning appear (Sari *et al*., 2018).

Based on the *World Health Organization* (WHO), pesticide poisoning occurs when the cholinesterase enzyme decreases by 30% from normal. Clinical symptoms will arise if the cholinesterase enzyme decreases by less than 50%. However, people consider the symptoms to resemble ordinary diseases because the symptoms of pesticide poisoning are not specific (Tutu, Manampiring, & Umboh, 2020). Research on pesticides on vegetables that were studied by Sari dan Lestari (2020) in several traditional markets in the city of Pekanbaru showed that vegetable samples were safe for consumption because the levels of pesticide residues were below the limiting level of 0.0048 mg/kg. But it is necessary to do research on cholinesterase enzyme levels in vegetable farmers to determine the impact of using pesticides.

RESEARCH METHODS

The type of research used by researchers is observational with the research design used being *cross-sectional*, namely research that is carried out one treatment in a group to find the relationship between the independent variable (risk factor) and the dependent variable (effect) (Notoatmodjo, 2020). The research was conducted at the Clinical Chemistry Laboratory at SMK Abdurrab Pekanbaru in May-June 2022. The population for this study was vegetable farmers who farmed on Jalan Garuda Sakti KM 6 Kampar serum from vegetable farmers who farmed on Jalan Garuda Sakti KM 6 Kampar. The sampling technique used was *purposive sampling*, namely sampling where the sample criteria were determined by the researcher.

The tools used in this study were centrifuges, *vacutainer* tubes without anticoagulants, *syringes, tourniquets*, 70% alcohol cotton, Pasteur pipettes, test tubes, sterile gauze, Optiva Spectrophotometer, cuvettes, 10-100 µL micropipette, 100-1000 µL micropipette, *blue tips*, *yellow tips*. The materials used in this study were reagent 1 (*phosphate buffer*), reagent 2 (*butyrylthiocholine substrate*), reagent 3 (*dibucaine chlorhydrate*), inhibitor reagent, distilled water, and serum samples.

Venous Blood Sampling followed the procedure of Siregar et al. (2018). Tools and materials are prepared. The patient is asked to sit or lie down with the arms extended. The *tourniquet* is placed on the patient's arm ± 10 cm above the elbow crease. The patient is asked to make a fist and disinfect it with 70% alcohol cotton. Venous blood vessels with an angle of 15^o using a *syringe*. Blood was taken as much as 3 mL. Blood is transferred into a vacutainer tube and homogenized.

Serum separation was carried out by Lestari et al. (2018). The *vacutainer* tube containing blood was centrifuged at 3000 rpm for 10 minutes. Serum and red blood cells were separated using a Pasteur pipette. Serum is put into a test tube.

Cholinesterase Enzyme Examination. The blank, namely 3000 µL of distilled water, was pipetted into a test tube using a micropipette and the distilled water was transferred to a cuvette. Negative control, namely Reagent 1 as much as 1500 µL was pipetted into a test tube. 1500 µL of inhibitor reagent was added to the cuvette and then homogenized. A sample of 10 µL was added to the cuvette and then homogenized. Reagent 2 as much as 50 µL was added to the cuvette and then homogenized. The absorbance was examined using a UV-Vis spectrophotometer with a wavelength of 405 nm and a temperature of 37oC. Determination of cholinesterase in the sample utilizing Reagent 1 as much as 1500 µL was pipetted into the cuvette. 10 µL serum sample was added to the cuvette and then homogenized. Reagent 2 as much as 50 μL was added to the cuvette and then homogenized. The absorbance of the solution was measured using a UV-Vis spectrophotometer with a wavelength of 405 nm and a temperature of 37°C.

RESULTS AND DISCUSSION

This study used 20 vegetable farmers in the city of Pekanbaru. Sampling was carried out according to the inclusion criteria. The sampled farmers consisted of 15 male farmers and 5 female farmers (Table 1). Respondents who were female, namely with sample codes C, E, M, Q, and T with different levels of cholinesterase. Gender has nothing to do with cholinesterase levels in the human body (Saragih, 2019). However, women should not spray pesticides because women have lower levels of the cholinesterase enzyme than men, especially women who are pregnant. Cholinesterase levels in pregnant women are lower than women who are not pregnant (Wicaksono, Widiyanto, & Subagiyo, 2016).

Table 1. Distribution of farmers based on sex and *Cholinesterase* levels

Sample Code	Gender	Cholinesterase Level U/L	Toxicity Level
Sample A	Male	5.264,686	No Poisoning
Sample B	Male	3.979,714	No Poisoning
Sample C	Female	6.912,500	No Poisoning
Sample D	Male	4.654,555	No Poisoning
Sample E	Female	8.941,648	No Poisoning
Sample F	Male	3.284,073	Mild Poisoning
Sample G	Male	5.930,282	No Poisoning
Sample H	Male	2.116,265	Mild Poisoning
Sample I	Male	3.755,537	No Poisoning
Sample J	Male	2.424,344	Mild Poisoning
Sample K	Male	4.647,622	No Poisoning
Sample L	Male	1.987,084	Mild Poisoning
Sample M	Female	4.730,822	No Poisoning
Sample N	Male	4.485,845	Mild Poisoning
Sample O	Male	2.230,674	Mild Poisoning
Sample P	Male	5.553,573	No Poisoning
Sample Q	Female	5.703,795	No Poisoning
Sample R	Male	2.024,755	Mild Poisoning
Sample S	Male	4.518,201	Mild Poisoning
Sample T	Female	3.494,383	Mild Poisoning

Note: The reference value for *Cholinesterase* levels in the blood of women is 3,930-10,800 U/L and that of men is 4,620-11,500 U/L (Ade et al., 2015).

The sample used in this study was serum from the venous blood of farmers who worked as sprayers. The principle of the *cholinesterase* test is that blood containing the enzyme *cholinesterase* will release acetic acid from *acetylcholine* (Marisa and Pratuna, 2018). Based on table 2, the results obtained were that 11 samples (55%) had normal *cholinesterase* values and 9 samples (45%) had decreased *cholinesterase* levels. Factors that can cause a decrease in *cholinesterase* levels in the body are exposure to organophosphate pesticides. Farmers who are exposed repeatedly and last for a long time can experience pesticide poisoning (Raini, 2007). Organophosphate class of pesticides will deactivate the *cholinesterase* enzyme so that acetylcholine cannot be hydrolyzed. Acetylcholine that is not hydrolyzed in excess will cause a decrease in *cholinesterase* levels in the blood (Marisa & Pratuna, 2018).

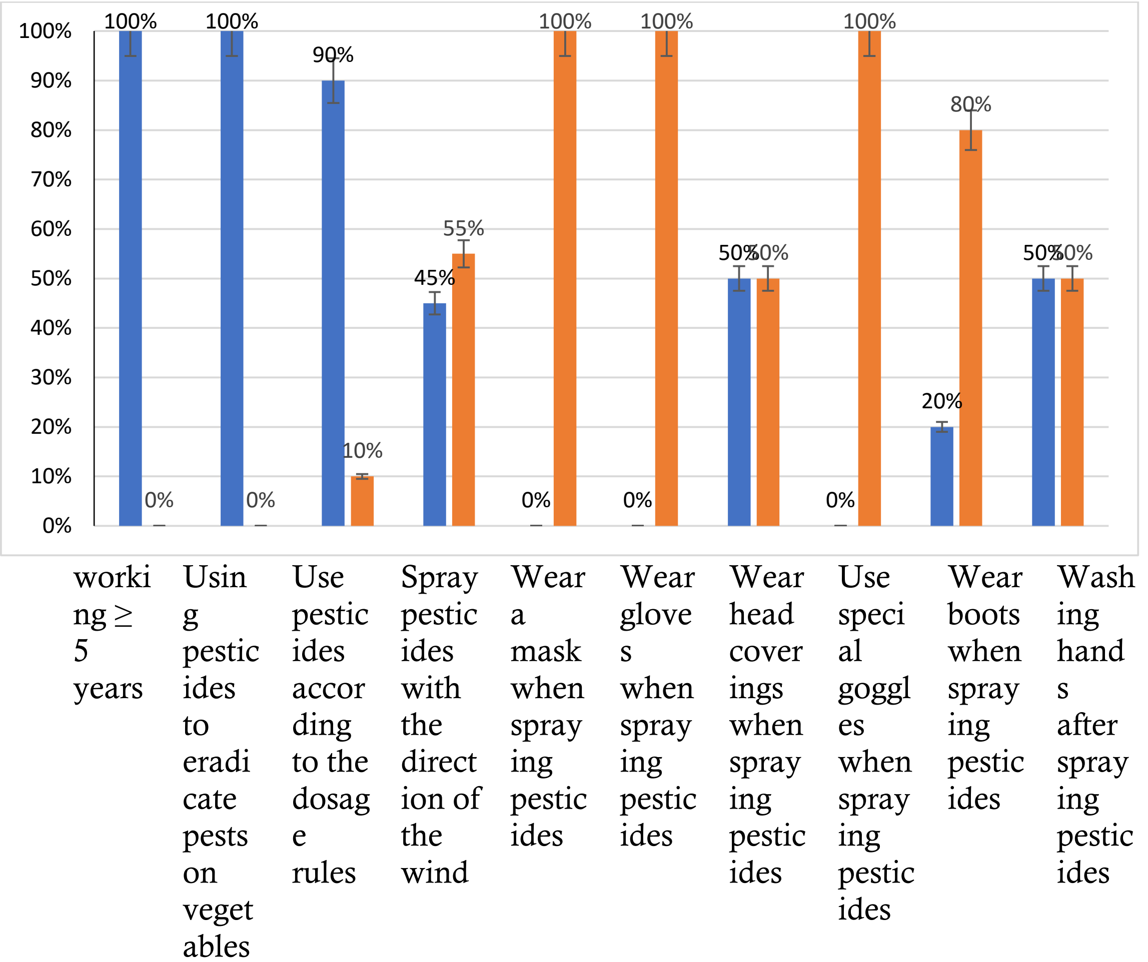
Table 2. Distribution of farmers by sex

Gender	Not poisoning	Mild poisoning	Total	Percentage
Male	7	8	15	75%
Female	4	1	5	25%
Total	11	9	20	100%

Factors that can affect poisoning due to exposure to pesticides are working period, frequency of spraying, method of spraying against the direction of the wind and the use of PPE in the form of masks, gloves, head coverings, special glasses and shoes that are not complete and the behavior of washing hands after spraying pesticides (Marisa & Arrasyid, 2017). The farmers who were sampled in this study had all worked ≥5 years and used pesticides to eradicate vegetable pests. Working period is a factor that can affect cholinesterase levels because the longer the working period, the longer farmers are exposed to pesticides.

The frequency of spraying pesticides can affect the levels of the cholinesterase enzyme. This can happen because the more often farmers spray pesticides, the higher the risk of pesticide poisoning. The frequency of spraying should be done 2 times per week (Samosir, Setiani, & Nurjazuli, 2017). In addition, this study is in line with the results of a study by Danudianti et al., (2016) which stated that there was a relationship between cholinesterase enzyme levels and the frequency of spraying pesticides. Based on the questionnaire data, it is known that some farmers spray in the direction of the wind. Farmers must pay attention to the direction of the wind when spraying pesticides. The risk of exposure to pesticides is greater if it is against the wind because the residue will turn back towards the pesticide sprayer (Rahmawati & Martiana, 2014). This will result in residue being inhaled and there is also absorption through the skin (Djojosumarto, 2008 dalam Pawitra, 2012)

Based on Graph 1, generally, farmers do not use complete PPE when spraying using incomplete PPE will cause a high risk of poisoning (Marisa & Arrasyid, 2017). The use of Personal Protective Equipment (PPE) when spraying pesticides is very important for farmers. The use of PPE can prevent or reduce direct contact. Based on the characteristics of the respondents, all farmers did not use complete PPE such as masks, special glasses, gloves and boots. Factors in preventing exposure to pesticide residues through inhalation, absorption and ingestion are using PPE (Syahputra, Siregar, Hartono, Bangun, & Wau, 2014).



CONCLUSION

Based on research on determining *cholinesterase* levels in the blood of vegetable farmers in Pekanbaru City using a UV-Vis Spectrophotometer out of 20 serum samples examined, 9 farmers (45%) experienced mild poisoning and 11 farmers (55%) had *cholinesterase* levels according to the reference (non-poisoned).

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