Unity in Diversity and the Standardisation of Clinical Pharmacy Services

Editors: Elida Zairina, Junaidi Khotib, Chrismawan Ardianto, Syed Azhar Syed Sulaiman, Charles D. Sands III and Timothy E. Welty
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List of symposium speakers

SYMPOSIUM 1: DEVELOPING CLINICAL PHARMACY

Prof. Charles D. Sands—Former Dean and Professor (retired), McWhorter School of Pharmacy, College of Health Sciences, Samford University, Birmingham, Alabama, USA
Dr. Surakit Nathisuwab—Associate Professor in Clinical Pharmacy in Clinical Pharmacy Division, Department of Pharmacy, Faculty of Pharmacy, Mahidol University, Bangkok, Thailand
Ms. Nor Hasni Bt Haron—Senior Principal Assistant Director Pharmaceutical Services Division, Ministry of Health of Malaysia
Dr. Budi Suprapta—A/Prof at Department of Clinical Pharmacy, Faculty of Pharmacy,Universitas Airlangga. Head of Pharmacy Department at Universitas Airlangga Teaching Hospital, Surabaya, Indonesia
Dr. Margaret Choye—Clinical Assistant Professor at College of Pharmacy, the University of Illinois at Chicago, USA. Clinical Pharmacist in Internal Medicine at the University of Illinois at Chicago Hospital and Health System, USA

SYMPOSIUM 2: ADVANCED PRACTICE 1

Dr. Hiroyuki Kamei—Office of Clinical Pharmacy Practice and Health Care Management, Faculty of Pharmacy, Meiji University, Nagoya, Japan
Dr. Hanna Sung—University of the Pacific. Thomas J. Long, School of Pharmacy and Health Sciences in California, USA
Dr. Alexandre Chan—Deputy Head and a tenured Associate Professor at the Department of Pharmacy, Faculty of Science at National University of Singapore (NUS) and the Duke-NUS Medical School, Singapore
Prof. Jae Wook Yang—Professor and Director of the Institute of Clinical Research and Practice, College of Pharmacy, Sahmyook University & Vice President of Korean College of Clinical Pharmacy
Prof. Dr. Syed Azhar Syed Sulaiman—Professor at School of Pharmaceutical Sciences at University Sains Malaysia, Penang, Malaysia

SYMPOSIUM 3: MOLECULAR PHARMACOLOGY AND PHARMACOGENOMICS

Dr. Mehdi Rajabi—Clinical Pharmacy and Pharmacy Practice, Islamic Azad University, Pharmaceutical Sciences Branch, Tehran, Iran. Clinical Pharmacist, Member of General Pharmaceutical Council of Great Britain
Mrs. Fan Zhang—Lanzhou University, a Pharmacist-in-Charge at Pharmacy Department of the First Hospital of Lanzhou University in China
Dr. Lemuwati Bennett—Assoc. Professor of Pharmaceutical Sciences at Union University School of Pharmacy in Jackson, Tennessee, USA
Prof. Robert D. Sinodel—Professor and former Dean of Faculty of Pharmaceutical Sciences, University of British Columbia; and Advisor, External relations, Centre for Health Evaluation & Outcomes Sciences (CHEOS), Providence Health Care research Institute and University of British Columbia, Canada
Dr. Baharudin Ibrahim—School of Pharmaceutical Sciences, Universiti Sains Malaysia, Penang, Malaysia

SYMPOSIUM 4: INTERPROFESSIONAL EDUCATION

Dr. Christine B. Teng—Assoc. Professor of Department of Pharmacy, National University of Singapore Principal Pharmacist (Clinical), Dept of Pharmacy, Tan Tock Seng Hospital, Singapore
Mr. Tan Wee Jin—Principle Pharmacist at Guardian Health & Beauty, Singapore
Dr. Ching Jou Lim—Senior lecturer in the Discipline of Social and Administrative Pharmacy, University Sains Malaysia, Malaysia
Mr. Mac Ardy J. Gloria—University of the Philippines, The Philippines
Dr. Vivian Lee Wing Yan—Assoc. Professor of the School of Pharmacy and the Assistant Dean (Student Development) of the Faculty of Medicine, Chinese University of Hong Kong

SYMPOSIUM 5: ADVANCED PRACTICE 2

Prof. Timothy E. Welty—Professor and Chair of Clinical Science in the College of Pharmacy and Health Sciences at Drake University, Iowa, USA
Dr. Takao Shimazoe—Department of Clinical Pharmacy and Pharmaceutical Care, Graduate School of Pharmaceutical Sciences, Kyushu University, Fukuoka, Japan
Prof. Zhou Quan—Professor and Vice Dean of Department of Pharmacy, The Second Affiliated Hospital of Zhejiang University, China
Prof. Sukhyang Lee—Professor of Clinical Pharmacy at College of Pharmacy, Ajou University, Korea
Prof. Kheirollah Gholami—Professor and Chairman at the Department of Clinical Pharmacy, College of Pharmacy, Iran

SYMPOSIUM 6: HEALTH CARE DELIVERY IN COMMUNITY PHARMACY

Prof. Michael D. Hogue—Assoc. Dean for the Center for faith and Health at Samford University's College of Health Sciences, Birmingham, Alabama, USA
Dr. Elida Zairina—Senior lecturer of Department of Pharmacy Practice, Faculty of Pharmacy, Universitas Airlangga, Surabaya, Indonesia
Ms. Leonila M. Ocampo—Chairman of the Hygienic Institute for Education, research and Training Inc, The Philippines
Ms. Yong Pei Chean—Senior Manager, Khoo Teck Puat Hospital and Council Member, Pharmaceutical Society of Singapore
Drs. Saleh Rustandi—Chairman of Himpunan Seminat Farmasi Masyarakat (HISFARMA) of Indonesia

SYMPOSIUM 7: PHARMACY EDUCATION

Dr. Takashi Egawa—Clinical Pharmacetics and Health Sciences, Department of Pharmaceutical and Health Care Management, Faculty of Pharmaceutical Sciences, Fukuoka University, Fukuoka, Japan
Prof. Yolanda R. Robles—Professor and former Dean College of Pharmacy, University of the Philippines
Prof. Rong-sheng Zhao—Professor in Peking University Third Hospital, China. Assistant to President, Deputy-Director in Pharmacy Department of Peking University Third Hospital, China
Dr. Manit SaeTewa—Staff of Faculty of Pharmaceutical Sciences, Ubon Ratchathani University, Thailand
Drs. Nurul Falah Eddy Pariang—President of Indonesian Pharmacist Association, Indonesia
Prof. Josep T. Dipiro—Dean, Professor and Archie O. McCalley Chair at the Virginia Commonwealth University, School of Pharmacy, Richmond, Virginia, USA

SYMPOSIUM 8: ADVANCED PRACTICE 3

Dr. Daraporn Rungprai—Academic Staff of Faculty of Pharmacy, Silpakorn University, Thailand
Ms. Hong Yen Ng—President, 11th Council, Pharmaceutical Society of Singapore Specialist Pharmacist (Oncology), Singapore General Hospital
Prof. Agung Endro Nugroho—Professor of Department of Pharmacology and Dean of Faculty of Pharmacy, Universitas Gadjah Mada, Yogyakarta, Indonesia
Dr. Farshad Hashemian—Assoc. Professor at Islamic Azad University, Pharmaceutical Sciences Branch, Tehran, Iran

Dr. Junaidi Khotib—Assoc. Professor of Department of Clinical Pharmacy at Faculty of Pharmacy, Universitas Airlangga, Surabaya, Indonesia

SYMPOSIUM 9: IMPROVING PATIENT MEDICATION SAFETY

Dr. Wimon Anansakunwatt—Siriraj Hospital, Thailand

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Ms. Yoon Sook Cho—Director of Pharmacy Department, Seoul National University Hospital, Korea

Dr. Surthiporn Pattharachayakul—Assistant Professor at the Department of Clinical Pharmacy, Prince of Songkla University, Thailand

Dra Mariyatul Qibtiyah—Head of Paediatric Pharmacy Services at Dr Soetomo Hospital, Surabaya, Indonesia

Prof. Charles F. Lacy—Professor of Pharmacy Practice and Vice President of Roseman University of Health Sciences, Henderson, Nevada, USA
Organophosphate toxicity in red chili farmers, Ciamis, Indonesia

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I.W. Arsanti  
Indonesian Centre for Horticulture Research and Development, Jakarta, Indonesia  
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ABSTRACT: The use of pesticides in Indonesia is increasing due to the socioeconomic situation in this country. This study was aimed to understand the impact of Personal Protective Equipment (PPE) to Organophosphate (OP) toxicity. Farmers planting red chili in Ciamis, Indonesia had been recruited, who were routinely and actively applying OP-containing pesticides. The blood chemistry, physical assessment, quality of life data, and OP level in red chili and ground were collected before and after the use of PPE. Thirty five farmers experienced tremors before and after the use of PPE. The impact of PPE used is significantly present in the hemoglobin, thrombocyte, erythrocyte sedimentation rate, lymphocyte, cholinesterase level and emotional function (p < 0.05). Nausea and dizziness decreased after the use of PPE. The residue of OP is present in the red chili and plant area. PPE can protect the red chili farmers in Ciamis, Indonesia from acute toxicity of OP.

1 INTRODUCTION

The use of pesticides in Indonesia is increasing due to the socioeconomic situation in this country. This study was aimed to understand the impact of Personal Protective Equipment (PPE) to organophosphate (OP) toxicity. Farmers planting red chili in Ciamis, Indonesia had been recruited, who were routinely and actively applying OP-containing pesticides. The blood chemistry, physical assessment, quality of life data, and OP level in red chili and ground were collected before and after the use of PPE. Thirty five farmers experienced tremors before and after the use of PPE. The impact of PPE used is significantly present in the hemoglobin, thrombocyte, erythrocyte sedimentation rate, lymphocyte, cholinesterase level and emotional function (p < 0.05). Nausea and dizziness decreased after the use of PPE. The residue of OP is present in the red chili and plant area. PPE can protect the red chili farmers in Ciamis, Indonesia from acute toxicity of OP.

2 METHODS

2.1 Subjects

We recruited 35 red chili farmers in Ciamis, West Java, Indonesia, who actively and routinely applied the organophosphate-containing pesticides during the planting session. The intervention was the PPE in use for one month, during which the farmers used organophosphate-containing pesticides. All participants signed the informed consent form according to the Ethical Approval of Ethics Committee of Universitas Ahmad Dahlan Number 011605113.

2.2 Data

The laboratory data, physical assessment, laboratory test and quality of life data were collected before and after the use of PPE for one month. The quality of life was measured using the Indonesian version of Short Formulary-36 (SF-36) questionnaire. The PPE included head cover, goggle glasses, mask, body cover, and boot shoes. Laboratory data was collected and assessed by Private Laboratory Company which has been accredited by National Standardization Agency.

The level of organophosphate in the red chili samples and ground were assessed using Gas chromatography method.

2.3 Data analysis
Paired sample T test was used to find the differences of physical assessment, laboratory test, and quality of life before and after the use of PPE for one month.

3 RESULTS AND DISCUSSIONS

Our study found that the use of PPE may influence the organophosphate toxicity, which is present in the forms of decrease of acute toxicity symptoms, laboratory data, and quality of life. Moreover, we also identified the profenovos concentration in the red chili.

Table 1 presents the farmers’ characteristics in Ciamis, West Java, Indonesia. Our study recruited 35 red chili farmers who are mostly male’s workers (94.3%). After the use of PPE, around 6 farmers did not participate in the study anymore. Most of their latest education was up to senior high school (62.9%) and their age mean was 42.23 years (SD 13.04). All of them experienced tremor both in the baseline and after PPE in use assessment. The significant increase was seen from the data of haemoglobin (14.7 to 15.3 g/dL), thrombocyte (282.3 to 314.8 uL), blood urea nitrogen (9.43 to 11.6 mg/dL), and creatinine serum (0.77 to 0.88 mg/dL) (p < 0.05). The significant decrease was seen from the data of lymphocyte (36.6 to 33.2%), cholinesterase (8.32 to 7.92 KU/L) and erythrocyte sedimentation rate for first hour (9.71 to 4.55), for second hour (17.9 to 13.1) (p < 0.05).

The use of PPE in our study can increase the hemoglobin and thrombocyte, moreover may decrease the lymphocyte, significantly. These results are in line with previous study which presented that the hemoglobin level of the control group was higher than the organophosphate-poisoned group (Hundekari et al. 2013).

The report of impaired of platelet function was found in previous case report of children exposed to home-made shampoo-contained organophosphate (Sadaka et al. 2011). Organophosphate could modify the antioxidant defense capability of person exposed by pesticides. Furthermore, the susceptibility of subjects to oxidative stress could be affected. This situation may cause the change of erythrocyte and lymphocyte which presented the stability of oxidative reaction and antioxidant defense capability (Banerjee et al. 1999). The decrease of erythrocyte sedimentation rate after the use of PPE showed the inflammation in the body, which may be caused by the organophosphate poisoning in the body. This result is supported by a previous case report which presented the change of complete blood count (Rizos et al. 2004).

Regarding to the renal function, after the PPE in use, the creatinin serum and BUN level increased. Our study results cannot confirm previous study that the use of PPE may protect the renal function (Rubio et al. 2012). This could be caused by the short use of PPE and other confounding variables may influence renal function, which we could not control during the study. The investigators have been encouraging the use of PPE; however, the
farmers did not employ the PPE properly. The farmers used inappropriate equipment to protect themselves, such as a common mask, repeated use of the clothes and did not use goggles glasses and boot. The farmers feel that PPE is annoying their activity. These reasons are also present in another study (Lu 2009). The suboptimal use of PPE could cause the organophosphate exposure to keep going on, thus the renal function tests and cholinesterase level in the second assessment decrease. These results are similar to the previous study in Thailand which presented that the long exposure of organophosphate may keep the low level of cholinesterase (Willsiwan & Siriwong 2014).

Table 1. Farmers’ characteristics in Ciamis, West of Java, Indonesia.

<table>
<thead>
<tr>
<th>Demography characteristics</th>
<th>Number</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>33</td>
<td>94.3</td>
</tr>
<tr>
<td>Female</td>
<td>2</td>
<td>5.7</td>
</tr>
<tr>
<td>Last Education</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No school</td>
<td>1</td>
<td>2.9</td>
</tr>
<tr>
<td>Elementary</td>
<td>10</td>
<td>28.6</td>
</tr>
<tr>
<td>Up to High School</td>
<td>22</td>
<td>62.9</td>
</tr>
<tr>
<td>Bachelor</td>
<td>2</td>
<td>5.7</td>
</tr>
<tr>
<td>Marital status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married</td>
<td>31</td>
<td>88.6</td>
</tr>
<tr>
<td>No</td>
<td>4</td>
<td>11.4</td>
</tr>
<tr>
<td>Age</td>
<td>Mean: 42.23 SD: 13.04</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Health characteristics</th>
<th>Number</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blood Pressure Pre PPE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal</td>
<td>23</td>
<td>65.7</td>
</tr>
<tr>
<td>Hypertension stage 1</td>
<td>10</td>
<td>28.6</td>
</tr>
<tr>
<td>Hypertension stage &gt; 2</td>
<td>2</td>
<td>5.7</td>
</tr>
<tr>
<td>Post PPE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal</td>
<td>10</td>
<td>28.6</td>
</tr>
<tr>
<td>Hypertension stage 1</td>
<td>15</td>
<td>42.9</td>
</tr>
<tr>
<td>Hypertension stage &gt; 2</td>
<td>4</td>
<td>11.5</td>
</tr>
<tr>
<td>Number of disease’s history 1</td>
<td>12</td>
<td>34</td>
</tr>
<tr>
<td>More than 1</td>
<td>23</td>
<td>66</td>
</tr>
<tr>
<td>Tremor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>35</td>
<td>100</td>
</tr>
<tr>
<td>No</td>
<td>29</td>
<td>100</td>
</tr>
</tbody>
</table>

Mean ± SD

<table>
<thead>
<tr>
<th></th>
<th>Pre PPE</th>
<th>Post PPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body weight (kg)</td>
<td>57.63 ± 8.5</td>
<td>46.57 ± 26.77</td>
</tr>
<tr>
<td>Hemoglobin (g/dl)*</td>
<td>14.74 ± 1.56</td>
<td>15.3 ± 1.46</td>
</tr>
<tr>
<td>Erythrocyte (million/ul)</td>
<td>4.62 ± 0.49</td>
<td>5.19 ± 0.40</td>
</tr>
<tr>
<td>Hematocrite (%)</td>
<td>45.44 ± 3.2</td>
<td>45.10 ± 4.38</td>
</tr>
<tr>
<td>Leucocyte (uL)</td>
<td>7.61 ± 1.44</td>
<td>8.15 ± 2.25</td>
</tr>
<tr>
<td>MCV (iL)*</td>
<td>87.26 ± 6.2</td>
<td>86.7 ± 6.86</td>
</tr>
<tr>
<td>MCH (pg)</td>
<td>28.69 ± 2.4</td>
<td>29.14 ± 2.48</td>
</tr>
<tr>
<td>MCHC (pg)*</td>
<td>33.33 ± 33.56</td>
<td>31.03 ± 1.10</td>
</tr>
<tr>
<td>RDW (%)</td>
<td>13.20 ± 1.2</td>
<td>13.5 ± 1.4</td>
</tr>
<tr>
<td>Thrombocyte (uL)</td>
<td>282.34 ± 59.8</td>
<td>314.6 ± 13.47</td>
</tr>
<tr>
<td>Lymphocyte (%)*</td>
<td>36.60 ± 8.2</td>
<td>33.28 ± 6.28</td>
</tr>
<tr>
<td>Cholinesterase (Ku/L)*</td>
<td>8.32 ± 2.3</td>
<td>7.92 ± 1.99</td>
</tr>
<tr>
<td>Blood Urea Nitrogen (mg/dl)*</td>
<td>9.43 ± 2.4</td>
<td>11.6 ± 3.1</td>
</tr>
<tr>
<td>Creatinine serum (mg/dl)*</td>
<td>0.77 ± 0.08</td>
<td>0.88 ± 0.15*</td>
</tr>
<tr>
<td>Erythrocyte sedimentation rate, first hour*</td>
<td>9.71 ± 1.8</td>
<td>4.55 ± 7.1</td>
</tr>
<tr>
<td>Erythrocyte sedimentation rate, second hour*</td>
<td>17.97 ± 3.3</td>
<td>13.17 ± 15.07</td>
</tr>
</tbody>
</table>

* Significant differences between pre and post PPE in use (p < 0.05).
All the patients experienced tremor as the symptoms of chronic toxicity of organophosphate. The inactivation of acetylcholinesterase by organophosphate may cause accumulation of acetylcholinesterase in muscarinic, nicotinic and nervous system sites. Our study results are in line with a previous study in India that found around 58% patients to experience acute organophosphate poisoning with tremor (Reji et al. 2016). Another study in New York also presented the neurotoxicity symptoms of male applicators-exposed by organophosphate (Stokes et al. 1995).

Specifically, we also explore the farmers’ condition that experienced abnormality of full blood count. Before the use of PPE, the abnormality of haemoglobin, erythrocyte, leucocyte, thromboocyte and cholinesterase are shown in 11.4%, 31.4%, 2.8%, 5.7%, 5.7% and 8.5% farmers, respectively. After the use of PPE, the abnormal proportion of full blood count decreased. We found one farmer with low level of cholinesterase and low level of hemoglobin. Moreover, there are two farmers with low cholinesterase and normal complete blood count level. The three farmers with low level of cholinesterase do not use PPE during the application of organophosphate-containing pesticide, work in wide area, long duration of application of organophosphate-containing pesticide and wash their clothes mixed with others. After the use of PPE, the farmers with low level of cholinesterase on baseline period experience the increase of cholinesterase level. The increase of cholinesterase level is followed by the increase of hemoglobin.

Two farmers with high level of leukocyte do not use PPE during the pesticide application and have long duration of application of organophosphate-containing pesticide. After the use of PPE, there are two farmers with the decrease of leukocyte level followed by the decrease of the cholinesterase level. Four farmers with low level of thromboocyte also did not use PPE during the application and had long duration of application of organophosphate-containing pesticide.

Table 2 presents the characteristics of organophosphate-containing pesticides, the use of PPE and the characteristics of acute toxicity symptoms. According to the use of organophosphate-containing pesticides, the farmers applied the pesticides around 12 hours before the assessment, both in before and after the use of PPE. They applied the organophosphate-containing pesticides for 1–2 times/week.

### Table 2. Characteristics of organophosphate-containing pesticides application, the use of PPE and acute toxicity symptoms.

<table>
<thead>
<tr>
<th>Application of organophosphate-containing pesticides</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours before assessment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>First assessment</td>
<td>12</td>
<td>7.9</td>
</tr>
<tr>
<td>Second assessment</td>
<td>12.1</td>
<td>12.2</td>
</tr>
<tr>
<td>Wide area (m²)</td>
<td>3800</td>
<td>119.8</td>
</tr>
<tr>
<td>Duration (month)</td>
<td>74</td>
<td>7.2</td>
</tr>
<tr>
<td>Frequency/week</td>
<td>1.54</td>
<td>0.7</td>
</tr>
<tr>
<td>Hours of pesticide application</td>
<td></td>
<td></td>
</tr>
<tr>
<td>First assessment</td>
<td>3.24</td>
<td>1.60</td>
</tr>
<tr>
<td>Second assessment</td>
<td>2.69</td>
<td>1.17</td>
</tr>
<tr>
<td>The use of personal protective equipment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Application of organophosphate-containing pesticides</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td></td>
<td></td>
</tr>
<tr>
<td>First assessment</td>
<td>16</td>
<td>46</td>
</tr>
<tr>
<td>Incomplete PPE</td>
<td>19</td>
<td>54</td>
</tr>
<tr>
<td>Second assessment</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Complete PPE</td>
<td>29</td>
<td>100</td>
</tr>
<tr>
<td>Incomplete PPE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reason for not using PPE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Discomfort</td>
<td>5</td>
<td>15</td>
</tr>
<tr>
<td>Unavailability</td>
<td>4</td>
<td>11</td>
</tr>
<tr>
<td>No explanation</td>
<td>26</td>
<td>74</td>
</tr>
<tr>
<td>Wash the clothes after using pesticides First assessment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Separated from other clothes</td>
<td>28</td>
<td>80</td>
</tr>
<tr>
<td>Mixed with other clothes</td>
<td>7</td>
<td>35</td>
</tr>
<tr>
<td>Second assessment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Separated from other clothes</td>
<td>23</td>
<td>79</td>
</tr>
<tr>
<td>Mixed with other clothes</td>
<td>6</td>
<td>20</td>
</tr>
</tbody>
</table>
Acute symptoms after using pesticides First assessment
- Nausea: 2, 5.7
- Nausea and Vomiting: 1, 2.9
- Dizziness: 3, 8.6
- Nausea and Dizziness: 28, 80

Second assessment
- Nausea: 1, 2.9
- Nausea and Vomiting: 1, 2.9
- Dizziness: 3, 8.6
- Nausea and Dizziness: 20, 37

Behavior toward the symptoms
- Nothing to do: 17, 49
- Buy medication: 8, 29
- Find physician: 4, 11
- Drinking milk: 2, 5

However, the duration of organophosphate-containing pesticide application decreased from around 3 hours to 2 hours after the PPE in use. There were no farmers using complete PPE. After using the PPE, the farmers who washed their clothes separated from other clothes decreased from 80% to 17%. After the use of PPE, the proportion of workers who experienced nausea and dizziness decreased from 80% to 57%. Moreover, around 49% subjects did not find medication to neutralize the symptoms.

The acute toxicity symptoms of nausea and dizziness decreased after the use of PPE. The decrease of these symptoms shows the tolerance mechanism of the body. The tolerance mechanism is defined by the decrease of response at certain dose following the repeated exposure, then need higher dose to reach similar effect (Vashista and Berrigan, 2017).

According to the symptoms of acute toxicity, the awareness of farmers to find medication is quite low. Most of them prefer to let the symptoms gone and did not recognize that they experienced the acute symptoms of organophosphate. The awareness of using PPE is also low due to the uncomfortable feeling of using the equipment and unavailability of the equipment. Even though the investigator already promoted the important of using PPE and separately wash their clothes, but the proportion of using complete PPE increase and the use of complete PPE decrease. Moreover, the proportion of separately wash the clothes decrease. These results are in line with previous study which stated that not all farmers were aware about using the PPE (Perry et al. 2000; Yassin et al. 2002).

Table 3 presents the quality of life score before and after the use of PPE. In general, the scores of qualities of life domain increased except for physical domain, pain and general health. The significant increase was shown in emotional health related to physical role and the significant decrease was shown in the pain domain.

In general, the scores of quality of life domains increase, except for physical function, pain, and general health. A previous study in Iran described that the farmers' quality of life was lower than the control group (p > 0.05). Only mental health of the farmers group and control group was significant different. However, the scores of quality of life domains in our study are higher than the previous study in Iran (Taghavian et al. 2016). According to the study design, the study in Iran did not measure the QoL differences before and after the use of PPE, however, the author compared the QoL in farmer group and control group.

Table 3. Farmers QoL before and after the PPE in use.

<table>
<thead>
<tr>
<th>Domain</th>
<th>Before PPE in use (x ± SD)</th>
<th>After PPE in use (x ± SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical Function</td>
<td>73.5 ± 23.1</td>
<td>66.9 ± 25.3</td>
</tr>
<tr>
<td>Role limitation-physical</td>
<td>47.1 ± 31.8</td>
<td>50.0 ± 29.5</td>
</tr>
<tr>
<td>Role limitation-emotion</td>
<td>47.8 ± 33.9</td>
<td>66.1 ± 36.4</td>
</tr>
<tr>
<td>Energy</td>
<td>66.5 ± 11.5</td>
<td>68.9 ± 13.8</td>
</tr>
<tr>
<td>Emotional Function</td>
<td>77.7 ± 15.4</td>
<td>77.0 ± 16.6</td>
</tr>
<tr>
<td>Social Function</td>
<td>63.4 ± 17.9</td>
<td>66.7 ± 19.1</td>
</tr>
<tr>
<td>Pain</td>
<td>64.8 ± 19.1</td>
<td>55.8 ± 19.4</td>
</tr>
<tr>
<td>General Health</td>
<td>64.1 ± 10.5</td>
<td>62.7 ± 10.1</td>
</tr>
</tbody>
</table>

* Significant difference (p < 0.05).
Table 4 lists the pesticides concentration in the red chili and plantation ground. It can be seen that the concentrations of profenofos were higher than 0, 33 mg/Kg in the red chili. According to the government rule of Joint Decree of Health Minister and Agriculture Minister Number: 881/MENKES/SKB VIII/1996 and 711/Kpts/TP.270/8/96, 22 August 1996 about Maximum Limit of Farmers Products. The maximum limit of profenofos pesticide residues in red chili was 0, 5 mg/kg. Two of the four samples of red chili contained profenofos pesticides above the threshold set by the government.

Table 4. Residue of organophosphate in red chili and ground.

<table>
<thead>
<tr>
<th>Sample group</th>
<th>Pesticide</th>
<th>Average of concentration (mg/Kg)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Red chili</td>
<td>ground</td>
</tr>
<tr>
<td>A</td>
<td>Diazinon</td>
<td>Not detected</td>
<td>Not detected</td>
</tr>
<tr>
<td></td>
<td>Parathion</td>
<td>Not detected</td>
<td>Not detected</td>
</tr>
<tr>
<td></td>
<td>Ethion</td>
<td>Not detected</td>
<td>Not detected</td>
</tr>
<tr>
<td></td>
<td>Profenofos</td>
<td>0,61</td>
<td>Not detected</td>
</tr>
<tr>
<td></td>
<td>Malation</td>
<td>Not detected</td>
<td>Not detected</td>
</tr>
<tr>
<td></td>
<td>Chlorpyrifos</td>
<td>Not detected</td>
<td>Not detected</td>
</tr>
<tr>
<td>B</td>
<td>Diazinon</td>
<td>Not detected</td>
<td>Not detected</td>
</tr>
<tr>
<td></td>
<td>Parathion</td>
<td>Not detected</td>
<td>Not detected</td>
</tr>
<tr>
<td></td>
<td>Ethion</td>
<td>Not detected</td>
<td>Not detected</td>
</tr>
<tr>
<td></td>
<td>Profenofos</td>
<td>0,39</td>
<td>Not detected</td>
</tr>
<tr>
<td></td>
<td>Malation</td>
<td>Not detected</td>
<td>Not detected</td>
</tr>
<tr>
<td></td>
<td>Chlorpyrifos</td>
<td>Not detected</td>
<td>Not detected</td>
</tr>
<tr>
<td>C</td>
<td>Diazinon</td>
<td>Not detected</td>
<td>Not detected</td>
</tr>
<tr>
<td></td>
<td>Parathion</td>
<td>Not detected</td>
<td>Not detected</td>
</tr>
<tr>
<td></td>
<td>Ethion</td>
<td>Not detected</td>
<td>Not detected</td>
</tr>
<tr>
<td></td>
<td>Profenofos</td>
<td>0,48</td>
<td>Not detected</td>
</tr>
<tr>
<td></td>
<td>Malation</td>
<td>Not detected</td>
<td>Not detected</td>
</tr>
<tr>
<td></td>
<td>Chlorpyrifos</td>
<td>Not detected</td>
<td>Not detected</td>
</tr>
<tr>
<td>Tanjung (PHT)</td>
<td>Diazinon</td>
<td>Not detected</td>
<td>Not detected</td>
</tr>
<tr>
<td></td>
<td>Parathion</td>
<td>Not detected</td>
<td>Not detected</td>
</tr>
<tr>
<td></td>
<td>Ethion</td>
<td>Not detected</td>
<td>Not detected</td>
</tr>
<tr>
<td></td>
<td>Profenofos</td>
<td>0,55</td>
<td>Not detected</td>
</tr>
<tr>
<td></td>
<td>Malation</td>
<td>Not detected</td>
<td>Not detected</td>
</tr>
<tr>
<td></td>
<td>Chlorpyrifos</td>
<td>Not detected</td>
<td>Not detected</td>
</tr>
</tbody>
</table>

* Limit of Detection for organophosphate analysis are: diazinon 3,84 µg/kg, parathion 0,82 µg/kg, ethion 2,76 µg/kg, profenofos 0,80 µg/kg, malathion 0,50 µg/kg, danchlorpyrifos 0,33 µg/kg.
Profenofos insecticide residues found in chili enters the body through the mouth, it may influence the human health. The impact on consumers is generally in the form of which chronic poisoning is not directly perceived. Symptoms of poisoning is a new look after a few months or years later (Dalimunthec al. 2015). Organophosphate pesticide residue was using Gas Chromatography, where the Limit of Detection (LoD) for organophosphate analysis are 3.84 µg/kg, 0.82 µg/kg, 2.76 µg/kg, 0.89 µg/kg, 0.50 µg/kg, and 0.33 µg/kg for diazinon, parathion, ethion, profenofos, malathion and chloropyrifos, respectively. Thus, the results of the analysis which were not detected had no possibility of its existence. None of the organophosphate pesticides except profenofos were applied during the whole period of the experiment in this treatment. Profenofos pesticides were not detectable in the ground sample. Studies conducted EPA (Environmental Protection Agency) 1999 profenofos had a degradation time of 7–8 days.

The degradation of pesticide was influenced by many factors, including application factors (times, rate, position etc.), pesticide properties (toxicity, persistence, volatility etc.) and weather conditions (temperature, humidity, wind, and photo effect) and microorganisms, etc. In this study, the times and rate of application, and rain were primary reasons for pesticide disappearance.

In addition, the effect of rains on degradation of organophosphates was probably less than pyrethroids (Zhang et al. 2007). Organophosphate physical-chemistry properties are also expected to affect the concentration of some organophosphates which are not detected by gas chromatography. Based on the analysis performed, the operational conditions of gas chromatography using column temperature 220°C, whereas some organophosphates only have a boiling point of not more than 220°C (Ekadewi, 2007). This causes some organophosphates already evaporated or broken first before reaching the detector gas chromatography.

Our study has limitation in sample size of study. We cannot fulfill the sample size criteria, due to the limited number of farmers who wanted to participate in this study. Further study need to be conducted to understand the association between variables in this study. Moreover, we could not control the use of PPE during one month, thus the results of this study still being confounded by particular variables.

4 CONCLUSION
The use of PPE may decrease acute toxicity symptoms of organophosphate, influence the full blood count level and improve the farmers’ quality of life.

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