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DETERMINANTS OF PERSONAL PROTECTIVE EQUIPMENT USE BEHAVIOR AMONG FEMALE FARMERS OF CHILDBEARING AGE EXPOSED TO PESTICIDES IN DEMPO SELATAN DISTRICT PAGAR ALAM CITY

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ABSTRACT

Female farmers of childbearing age are at risk of adverse health effects due to pesticide exposure in agricultural activities. The use of Personal Protective Equipment (PPE) that does not meet the required standards is one of the factors that causes high pesticide exposure in female farmers of childbearing age. Therefore, the objective of this research was to analyze the factors associated with PPE use behavior among female farmers of childbearing age in South Dempo District of Pagar Alam. This research was a quantitative analytic with a cross-sectional approach. The population of this study was all farmers of childbearing age in the South Dempo District Pagar Alam. A sample of 116 respondents was selected through simple random sampling. Data collection was conducted through interviews using a questionnaire. Data processing was carried out with the stages of editing, coding, entry, and cleaning. Bivariate analysis employed the chi-square test, while multivariate employed the multiple logistic regression. The results of the bivariate analysis showed that there were significant associations between the variables and PPE use behavior: education level, income level, knowledge, attitude, and PPE availability (p-value<0.05). In contrast, age, work period, and agricultural extension worker support were not significantly associated with PPE use behavior (p-value>0,05). The multivariate analysis showed that the most dominant variable determining PPE use behavior was PPE availability. The study concluded that PPE availability was the most determining factor in the PPE use behavior among female farmers of childbearing age.

Keywords: Pesticide, PPE use behavior, PPE availability, Female farmers of childbearing age

Introduction

The agricultural sector in Indonesia is at the center of the government's attention because this sector has a very crucial role in national development, especially in terms of the utilization of agricultural products concerning food commodities.[1] Based on data from the 2018 Inter-Census Agricultural Survey, it was reported that the number of farmers in Indonesia totaled 33,487,806 people with 8,051,328 women and 25,436,478 men.[2]

To improve the quality of agricultural production and reduce pest attacks, farmers choose to use pesticides because they are considered effective and efficient.[3] Currently, around 2 million tons of pesticides are used worldwide. Of this amount about 47.5% are herbicides, 29.5% are insecticides, 17.5% are fungicides and 5.5% are other pesticides. The top ten pesticide consuming countries in the world are China, the USA, Argentina, Thailand, Brazil, Italy, France, Canada, Japan and India.[4] The use of pesticides in Indonesia itself is still relatively high, especially in the agricultural sector. This is supported by the increase in the use of pesticides nationally every year. Based on data from the Ministry of Agriculture of the Republic of Indonesia in 2016 there were 3,247 pesticide formulations used for the agricultural and forestry sectors.[5]

In the hierarchy of hazard control, the use of personal protective equipment (PPE) is the last step in controlling hazards. That is, before deciding to use PPE, other steps must be taken first by making optimal efforts so that hazards or hazards can be eliminated or at least minimized.[6] Although personal protective equipment (PPE) is considered the last line of defense, the use of PPE is the most likely to be used by farmers as workers who work in the informal sector.[7]

One of the main factors for the high cases of pesticide poisoning is the lack of implementation of appropriate safety behavior, especially for farmers who do not use PPE in the use of pesticides. The use of PPE is part of healthy behavior. According to Notoatmodjo[8], healthy behavior is an action related to efforts to prevent or avoid disease and the causes of disease, as well as actions to seek, maintain and improve health. Poor PPE use behavior can increase the potential for pesticide exposure in farmers. When farmers do not use PPE properly, there is a higher risk of direct exposure to pesticides which can result in pesticide poisoning.

The use of pesticides not only provides benefits, but it also carries risks to health and the environment. Pesticides can enter the human body through the skin, breathing and digestion. Excessive use can cause acute poisoning and long-term health effects, including cancer and reproductive disorders.[9] Data from UNEP[10] recorded 1-5 million cases of pesticide poisoning in farmers with a death rate of 220,000 people each year and about 80% of pesticide poisoning occurs in developing countries. Some cases of pesticide poisoning occur when mixing and spraying pesticides.[11] One of the groups at high risk of pesticide poisoning with long-term negative impacts is female farmers of childbearing age. Based on the Central Bureau of Statistics before 2018, around 8 million farmers or almost 24% of the total farmers in Indonesia were women. This figure

will continue to increase considering the contribution of women in the agricultural sector is very large. The intensity of pesticide exposure in women of childbearing age can risk reproductive disorders such as infertility, spontaneous abortion, giving birth to babies with disabilities, prematurity, LBW, and children at risk of stunting.[12]

Pagar Alam City is one of the cities in South Sumatra Province with the agricultural sector as the leading sector. The agricultural potential in Pagar Alam City is also supported by the main business field in Pagar Alam City, where almost half of the population of Pagar Alam City still depends on the agricultural sector, which is 48.26 percent.[13] The number of farmer groups in South Dempo is 176 groups with a total of 2,830 farmer group members.[14] The perpetrators of agricultural activities involving the use of pesticides in South Dempo District are not only male farmers, but female farmers, especially women of childbearing age, are also involved in these activities.

Personal protective equipment is essential to protect the body from pesticide exposure while working. However, farmers' awareness of using personal protective equipment when in contact with pesticides is generally still low. Previous research in Sekayu District, South Sumatera stated that the % of female farmers of childbearing age who never wore masks while working in agriculture was quite high at 51.5%.[12] Based on a preliminary survey in South Dempo District, it was found that the behavior of using PPE on female farmers of childbearing age who apply pesticides is still not good. Most farmers only use hats, long-sleeved clothes, and long pants intending to just avoid the heat of the sun and some even do not use appropriate PPE at all. From the interviews conducted, the reason why farmers do not use PPE is that they are uncomfortable when using PPE, are accustomed to not using complete PPE from the beginning of work, and feel that they have never experienced pesticide poisoning. Therefore, this study aims to analyze the factors associated with PPE use behavior in female farmers of childbearing age exposed to pesticides in South Dempo District, Pagar Alam City.

Methods

This research was a type of observational quantitative research with a cross-sectional research design. The population in this study were all female farmers of childbearing age who were exposed to pesticides in South Dempo District, Pagar Alam City. The study population comprised all female farmers of childbearing age who were exposed to pesticides in South Dempo Subdistrict, Pagar Alam City. The size of the study population was unknown. Samples were taken using *simple random sampling*. The calculation of the minimum sample size in this study was determined using the theory of Lemeshow's (1997) two-proportion hypothesis test formula so that a total of 116 samples were obtained in this study. Data collection used in this study was primary data obtained through direct interviews with samples using questionnaires that have been provided. Data to be

taken on farmers are independent variables consisting of age, education level, income, work period, knowledge, attitudes, PPE availability, and agricultural extension support and the dependent variable (PPE use behavior). Data obtained from interviews using questionnaires were processed using the SPSS computer program application. Data analysis is carried out was in univariate, bivariate and multivariate ways. Statistical test analysis in this study used a chi-square test and multiple logistic regression test with a prediction model. The data processed and analyzed is presented in the form of tables and interpretations containing explanations of information obtained from the results of the analysis in descriptive form. This research obtained a certificate of ethical review from the Health Research Ethics Commission of the Faculty of Public Health, Sriwijaya University with number: 450/UN9.FKM/TU.KKE/2023.

Results

Table 1. Distribution of Respondents Based on Age, Education, Income, Work period. Knowledge, Attitudes, PPE Availability, Agricultural Extension Workers Support, and PPE Use Behavior

Variables	n	%
Age		
< 38 years old	55	47,4
≥ 38 years old	61	52,6
Education		
Not in School	3	2,6
Elementary school	40	34,5
Junior high school	29	25,0
High school	38	32,8
College	6	5,2
Income		
< 1.000.000	38	32,8
≥ 1.000.000	78	67,2
Work period		
≥ 15 years	61	52,6
< 15 years	55	47,4
Knowledge		
Bad	95	81,9
Good	21	18,1
Attitude		
Bad	69	89,5
Good	47	40,5
PPE Availability		
Incomplete	54	46,6
Complete	62	53,4
Agricultural Extension Workers Support		
Not in favor	56	48,3
Support	60	51,7
PPE Use Behavior		
Bad	57	49,1
Good	59	50,9

The distribution of respondents according to their characteristics, knowledge, attitudes, work period, PPE availability, agricultural extension workers support, and PPE use behavior is presented in Table 1 below. More respondents were aged ≥ 38 years (52.6%), the education mostly

elementary school (34.5%), and the majority of respondents had an income ≥ 1,000,000 per month (67.2%). The work period was mostly ≥ 15 years (52.6%), almost all respondents had bad knowledge (81.9%), and most of the respondents had a bad attitude in PPE use (89.5%). The majority of respondents who reported complete PPE availability (53.4%), as well as those who received agricultural extension workers support (51.7%), exhibited positive PPE use behavior.

Based on table 2, bivariate analysis was performed using the chi-square test between the independent variables and the dependent variable. Independent variables including education level (p=0,019), income level (p=0,002), knowledge (p=0,02), attitude (p=0,034) and PPE availability (p=0,000) are variables associated with PPE use behavior. While the variables of age (p=0,570), work period (p=0,845), and agricultural extension workers' support (p=0,461) were not associated with PPE use behavior.

Table 2. Relationship between Age, Education level, Income level, Work period, Knowledge, Attitudes, PPE Availability, Agricultural Extension Workers' Support, with PPE Use Behavior

Variables	PPE Use Behavior				Total		*P-Value*	PR (95% CI)
	Bad		Good					
	n	%	n	%	n	%		
Age								
< 38 years old	25	45,5	30	54,5	55	100	0,570	0,866 (0,595 – 1,261)
≥ 38 years old	32	52,5	29	47,5	61	100		
Education level								
Low	42	58,3	30	41,7	72	100	0,019	1,711 (1,086 – 2,697)
High	15	34,1	29	65,9	44	100		
Income level								
Low	27	71,1	11	28,9	38	100	0,002	1,847 (1,307 – 2,612)
High	30	38,5	48	61,5	78	100		
Work period								
≥ 15 years	31	50,8	30	49,2	61	100	0,845	1,075 (0,741 – 1,560)
< 15 years	26	47,3	29	52,7	55	100		
Knowledge								
Bad	52	54,7	43	45,3	95	100	0,020	2,299 (1,047 – 5,049)
Good	5	23,8	16	76,2	21	100		
Attitude								
Bad	40	58	29	42	69	100	0,034	1,603 (1,043 – 2,463)
Good	17	36,2	30	63,8	47	100		
PPE Availability								
Incomplete	40	74,1	14	25,9	54	100	0,000	2,702 (1,749 – 4,172)
Complete	17	27,4	45	72,6	62	100		
Agricultural Extension workers Support								
Not in favor	30	53,6	26	46,4	56	100	0,461	1,190 (0,821 – 1,725)
Support	27	45	33	55	60	100		

Based on Table 3, the results of the multivariate analysis show that the variables significantly associated with PPE use behavior were the PPE availability, income level, and education level controlled by confounding variables, namely the variables of agricultural extension workers' support, knowledge, and attitude. From the test results obtained the most dominant variable that influences PPE use behavior was the PPE availability because it had the highest PR

value. The PR value of PPE availability was 16.437 with a confidence interval of 5.228 - 51.682 explaining that the incomplete PPE availability has a risk of 16.4 times behaving badly in the use of PPE and at a confidence degree of 95% researchers believe the incomplete PPE availability increases the risk of bad PPE use behavior 5.228 to 51.682 time.

Table 3. Final Model of Multivariate Analysis

Variables	*P-Value*	PR	95%CI
Education level	0,007	4,372	1,502 – 12,725
Income level	0,001	6,383	2,092 – 19,479
PPE Availability	0,000	16,437	5,228 – 51,682
Agricultural Extension Workers Support	0,338	1,620	0,603 – 4,353
Knowledge	0,113	3,521	0,744 – 16,670
Attitude	0,072	2,777	0,912 – 8,456

Discussion

Behavior is an individual response to their environment, which involves action and reaction. This means that new behavior will emerge if there is something needed to trigger a response called a stimulus. Thus a stimulus will certainly cause certain behaviors as well.[15] PPE use behavior is part of healthy behavior. According to Notoatmodjo[8], healthy behavior is an action related to efforts to prevent or avoid disease and the causes of disease, as well as actions to seek, maintain and improve health.

Pesticides can enter the body of farmers through several ways, namely through the skin, breathing, and digestion. Once absorbed, pesticides are circulated by the bloodstream to all body tissues. Pesticides are then metabolized in the liver and kidneys to be converted into a form that is more easily excreted. However, if the excretion process does not go smoothly, pesticide residues and their toxic metabolites can accumulate in the body. The accumulation of pesticide residues has the potential to interfere with the work of body organs, the nervous system, and cell function, causing adverse health effects.[16]

Poor PPE use behavior can increase the potential for pesticide exposure in farmers. When farmers do not use PPE properly, there is a higher risk of direct exposure to pesticides which can trigger negative health effects, especially for female farmers of childbearing age which can cause reproductive disorders such as spontaneous abortion, birth defects, LBW, infertility, anemia and thyroid dysfunction. Thus, these women's health problems will also have an impact on children, namely future generations. Based on research conducted by Widyawati, Siswanto[17], said that from the data on reproductive health history, it turns out that there are more than 20% of female farmers experience problems, in the form of LBW 4.7% and miscarriage 18.6%, this is caused by one of the environmental factors, especially pesticide exposure which can affect maternal health and fetal development during pregnancy. When women are exposed to pesticides during pregnancy, some

chemicals can enter directly into the fetus in the womb. In its developmental phase, the fetus is very vulnerable to the toxic effects caused by pesticides.[18]

Based on the results of the study, it show that most of the female farmers of childbearing age in South Dempo District have good behavior in the use of PPE. Nevertheless, there is still a considerable proportion of female farmers of childbearing age who show poor behavior in the use of PPE. Almost all farmers never use PPE goggles and farmers rarely use PPE masks, gloves, and boots, and almost all PPE used by farmers do not meet safety standards. The main reasons given were discomfort, habit, and the perception that they had never experienced pesticide poisoning. The use of PPE in farmers has not been optimally used, this is because farmers have not fully made PPE a very mandatory thing to use. In addition, which is a factor in the low behavior of using PPE on farmers because of constrained money to buy appropriate standard PPE, farmers prefer to spend money to increase the economic value of their crops rather than to protect their safety, the price of standard PPE is quite expensive causing personal safety has not become a priority for farmers. This is due to the low awareness of farmers in the use of PPE and lack of knowledge about the risks of pesticide hazards so farmers act with unsafe behavior.

The results showed no significant relationship between age and PPE use behavior among female farmers of childbearing age in the South Dempo District. The results of this study are in line with research conducted by Jannah and Handari[19], which showed that there was no significant relationship between age and PPE use behavior. Age is a predisposing factor that can affect a person's absorption and mindset, where the increase in a person's age will be directly proportional to the development of his absorption and mindset. Then the knowledge received can be understood properly and they can take better health actions or behaviors as well. The readiness of individuals to develop an increased sense of responsibility and care can also be influenced by the increasing age of the individual.[8] In theory, older age is expected to have good behavior.

In this study, although statistically there was no significant relationship between age and respondent behavior, the proportion of female farmers of childbearing age aged < 38 years tended to be more well-behaved in the use of PPE compared to those aged ≥ 38 years. This is in line with the theory that younger age groups will tend to find it easier to accept and utilize the information they get. The older a person is, the more difficult it is to change their behavior because they already have knowledge, attitudes and skills that they have believed in for years. In addition, according to Anggraeni[20], the older the farmer, the more experience he has, and has habits that are difficult to change.

The results showed that there was a significant relationship between education and PPE use behavior among female farmers of childbearing age in the South Dempo District. According to Notoatmodjo[8], education is an effort designed to influence individuals, groups or communities, so that they do what the education actors do. Education is a factor that affects the quality of a person's

behavior, where the level of education can affect the level of knowledge of each individual. If the level of education is good, then the knowledge will also be good, and the behavior that arises will also be good. The results of this study are in line with research conducted by Kumala, Rahardjo[21], showing that education has a significant relationship to PPE use behavior.

The quality of human resources is measured by the level of education, where the higher a person's education, the better the quality of human resources. Based on research conducted by Bondori, Bagheri[22], it states that highly educated farmers have better knowledge about PPE use behavior and are considered individuals who are more proactive in implementing this behavior. In contrast, according to Jannah, Asmaningrum[23], stated that the majority of respondents had a low level of education which resulted in the practice of using PPE, not by the standards that should be. Based on the results of this study, most female farmers of childbearing age who are highly educated tend to have good behavior in the use of PPE and vice versa female farmers of childbearing age who are low educated tend to have poor behavior in the use of PPE. This proves that the level of education affects a person's behavior.

The results showed that there was a significant relationship between income and PPE use behavior in female farmers of childbearing age in the South Dempo District. Economic status is assessed by the amount of income received by respondents each month. Income is one of the factors that can influence PPE use behavior in farmers. Farmers with higher incomes may be more able to afford high-quality PPE, while farmers with low incomes may be limited in purchasing appropriate PPE. The results of this study are in line with research conducted by Hayati, Kasman[24], showing that there is a relationship between income and PPE use behavior. Based on the results of this study, proportionally the number of farmers with high income levels is much more than those with low income, where the majority of farmers have an income of ≥1,000,000. However, when viewed from the behavior in the use of PPE, farmers with low education tend to have poor behavior in the use of PPE. Meanwhile, farmers with higher education have more good behavior in the use of PPE. This proves that income affects a person's behavior.

The results showed that there was no significant relationship between work period with PPE use behavior among female farmers of childbearing age in the South Dempo District. The results of this study were in line with research conducted by Fitriyani and Yusnilasari[25], showing that there was no relationship between work period with PPE use behavior. Based on the results of this study, proportionally the number of female farmers of childbearing age with a work period (≥ 15 years) was more than those with a work period (< 15 years), where the majority of them have worked for ≥ 15 years. Female farmers with work periods (≥ 15 years) have more bad behavior in the use of PPE than work periods (< 15 years). Women farmers of childbearing age with work periods(≥ 15 years) still underestimate the dangers of pesticides and tend to ignore them. They may ignore the importance of good PPE use behavior because they feel they are experienced enough and the level

of discipline decreases due to boredom. This is in line with Alfirdha and Nuraeni[26], who stated that someone who has a longer working period sometimes experiences a decrease in productivity due to boredom which can lead to a lack of compliance in the application of occupational safety and health. In addition, often for workers who have been working for a long time, there is a reluctance to use PPE, especially if they have never experienced work accidents or occupational diseases even though they are not disciplined in using PPE.[26]

The results showed that there was a significant relationship between knowledge and the behavior of using PPE in female farmers of childbearing age in the South Dempo District. Knowledge affects a person's behavior. This is supported by Lawrence Green's theory that knowledge is included in one of the predisposing factors that can influence behavior change. The better the level of knowledge, the more positive the behavior. Based on the results of this study, proportionally, there is a large difference between female farmers of childbearing age who have poor knowledge and female farmers of childbearing age who have good knowledge, whereas most female farmers of childbearing age have poor knowledge. In this study, women farmers of childbearing age who have poor knowledge will tend to behave badly and vice versa women farmers of childbearing age who have good knowledge will tend to behave well too. The results of this study are in line with research conducted by Souisa, Lekatompessy[27] which states that there is a significant relationship between farmer knowledge and PPE use behavior. This proves that knowledge affects a person in behavior.

The results showed that there is a significant relationship between attitude and behavior of using PPE on female farmers of childbearing age in South Dempo District. The results of this study are in line with research conducted by Supriono, Roga[28], stating that there is a significant relationship between attitudes and PPE use behavior. The attitude of farmers in the use of PPE has an important influence, especially in the health sector. The positive attitude of farmers is crucial to increase their awareness of the need to use PPE as a measure of self-protection from the potential dangers of pesticides or other chemicals.[29] Based on the results of this study, proportionally the number of farmers who have a bad attitude is more than those who have a good attitude. In this study most female farmers of childbearing age who have a good attitude tend to behave well in the use of PPE and vice versa female farmers of childbearing age who have a bad attitude tend to behave badly in the use of PPE. This proves that attitude is a factor that will influence a person's behavior.

The results showed that there was a significant relationship between the availability of PPE and the behavior of using PPE on female farmers of childbearing age in the South Dempo District. The results of this study are in line with research conducted by Setyowati, Widyastutik[30], showing that there is a significant relationship between the availability of PPE and the use of PPE. According to the theory of behavior by Lawrence Green, behavior is also influenced by supporting

factors that are manifested in the availability or absence of facilities or means that support a behavior to be a person's response. In this study, one of the supporting factors is the availability of PPE. This is likened to if farmers already have good knowledge and attitudes, but the unavailability of supporting tools to behave well in handling pesticides such as PPE, then farmers will still behave badly.

Farmers who have complete PPE availability will encourage farmers to have good PPE behavior when applying pesticides. Based on the results of this study, proportionally the number of farmers who have complete PPE availability is more than those with incomplete PPE availability. In this study, most of the female farmers of childbearing age who had complete PPE availability tended to behave well in the use of PPE and vice versa female farmers of childbearing age who had incomplete PPE availability tended to behave badly in the use of PPE. This proves that the availability of PPE is a factor that will influence a person's behavior. In addition, the results of multivariate analysis showed that the variable availability of PPE is the most dominant variable to be a risk factor for bad behavior in the use of PPE with the highest PR value of 16.437 (95% Cl 5.228 - 51.682) which means that female farmers of childbearing age who do not have complete PPE availability are at risk 16.43 times to behave badly in the use of PPE compared to female farmers of childbearing age who have complete PPE availability after being controlled by variables of agricultural extension support, knowledge and attitude.

The results showed that there was no significant relationship between the support of agricultural extension workers and the behavior of using PPE on female farmers of childbearing age in the South Dempo District. This result is not in line with Lawrence Green's theory, which states that one of the factors driving the formation of a behavior is the support of attitudes and behaviors from agricultural extension workers or other reference groups. In addition, the results of this study are not in line with research conducted by Jannah and Handari[19], which showed that there was a significant relationship between agricultural extension workers and PPE use behavior. Although there is no relationship between agricultural extension support and PPE use behavior, when viewed from the proportion of female farmers of childbearing age who get agricultural extension support tend to be more well-behaved in using PPE than those who do not get support, although the proportion difference is not too large. This shows that the support provided by agricultural extension workers is only limited to quantity, but not quality, so it has not been able to change PPE use behavior significantly. Agricultural extension support needs to be improved in terms of intensity, frequency, methods and materials delivered to more effectively influence farmer behavior.

Conclusion

Based on the results of the research conducted, it can be concluded that there is a significant relationship between education, income, knowledge, attitudes and availability of PPE with PPE use behavior in female farmers of childbearing age in South Dempo District. While the variables of age, work period, and agricultural extension support are not significantly related to the behavior of PPE use in female farmers of childbearing age in the South Dempo District. The PPE use behavior of female farmers of childbearing age is caused by the most dominant factor, namely the availability of PPE.

It is recommended for female farmers of childbearing age to get used to using PPE that is complete and according to standards, including hats, glasses, masks, long sleeves, long pants gloves, and boots every time they apply pesticides to avoid disease disorders due to pesticide exposure. In addition, it is also recommended for the agriculture office to collaborate across sectors in increasing farmers' knowledge by routinely conducting socialization about the dangers of pesticides and also forming agricultural cooperatives to provide quality agricultural PPE at subsidized prices, either through direct assistance or through an agricultural cooperative mechanism.

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Conflict of Interest

There is no conflict of interest.

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