



The Effect Of Pesticide Exposure On Onion Farmers On The Event Of LBW In Sembalun District

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Abstract

Pesticides are not only useful for suppressing the emergence of pests and plant diseases, excessive or inappropriate use can have a negative impact on health, especially pregnant women because it can interfere with the growth of the fetus, so that when the baby is born, the baby has low birth weight (LBW). This study was to determine the effect of pesticide exposure on shallot farmers during pregnancy with the incidence of LBW in Sembalun District, East Lombok Regency. This research is an observational study with a cross-sectional approach and conducted by

interview. The variables studied were the history of pesticide exposure consisting of: agricultural activities, years of service, length of work, pesticide storage, pesticide dose, shallot storage, and use of personal protective equipment (PPE). Data analysis used univariate analysis, bivariate with chi-square test and multivariate with multiple logistic regression test. Pesticide exposure which is proven to have the most dominant influence on the incidence of LBW is the use of PPE (OR = 4.64, p-value = 0.004). The recommended advice is to always wear PPE when doing agricultural activities and reduce agricultural activities related to pesticides, especially during pregnancy.

Keywords: LBW, exposure to pesticides, shallot farmers

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Introduction

Problems related to decreased productivity and crop failure are problems that are often faced by farmers as a result of pests and plant diseases (Yuantari, 2013). This condition makes farmers choose to use pesticides to eradicate pests and plant diseases. However, pesticides are not only useful for suppressing the emergence of pests and plant diseases, the chemical content in pesticides can also pollute the environment and can cause acute to chronic health problems (Louisa, 2018).

The body that has been exposed to pesticides can cause poisoning and cause disruption of the work of acetylcholinesterase in the central and peripheral nervous systems (Alen, 2015). In addition, exposure to pesticides can also have a negative impact on thyroid hormones, causing the thyroid gland to not produce thyroxine (T4) and triiodothyronine (T3) (Kusumawati, 2012).

Research in rural North China in 2015 found that pesticide exposure due to high pesticide use and women's involvement in agricultural activities led to low birth weight (Ding, 2015). The same study in 2013 in Brazil showed that directly or indirectly women who were exposed to pesticides could cause the prevalence of low birth weight babies to increase (Boccolini, 2013).

Shallots are very susceptible to pests, especially when planted in large areas. Until now, onion treatment is still carried out using synthetic pesticides, generally farmers spray pesticides regularly starting 10 days after planting until the onions are ready to harvest, besides that farmers will be more intensive in spraying pesticides and increasing the use of pesticide doses if pests attack in large quantities (Aldila, 2017). However, this can lead to pesticide residues or deposits that can pollute the environment, other impacts pose a risk to farmers' health due to exposure to pesticides, especially pregnant women who carry out agricultural activities when spraying pesticides are carried out or when other activities are carried out related to pesticides such as harvesting red onions. This allows pesticide exposure to occur due to residual pesticides that are still attached to the shallot plant (Damayanti, 2016). Exposure to pesticides can be a risk to the health of pregnant mothers womb due to the



presence of pesticides in the body can interfere with the development of the fetus conceived so that the condition can experience a low birth weight baby is born (Fatmawati, 2016).

LBW is a condition in babies born weighing less than 2,500 grams (Indah, 2020). LBW infants are eight times more likely to die compared to non-LBW infants, most of the infant deaths during the neonatal period occur in infants weighing < 2,500 grams (Depkes RI, 2013).

Based on data from the 2019 NTB Provincial Health Profile, the Infant Mortality Rate (IMR) in NTB Province in 2019 was 863 cases, the most deaths occurred in East Lombok Regency (Dinkes Provinsi NTB, 2019). The percentage of LBW in NTB Province in 2019 was 3.91% (BPS, 2020). East Lombok Regency is one of the areas in NTB Province that has experienced an increase in the number of LBW cases in the last three years since 2017. Based on data obtained from the East Lombok Regency Health Office, the number of babies with LBW in East Lombok Regency in 2017 was 798 (3, 05%), in 2018 as many as 823 (3.11%) and in 2019 as many as 911 (3.41%) (BPS, 2020).

Sembalun District is one of the areas in East Lombok Regency and is the second largest shallot farming location in NTB with an area of 1155 Ha. The number of babies with low birth weight in 2019 and 2020 was 67 babies, more when compared to the other two areas in East Lombok Regency which are also locations for onion farming, namely Wanasaba District with 48 babies and Sambelia District with 52 babies.

Based on a preliminary study conducted in April 2021 on 12 female farmers, it shows that women are involved in agricultural activities such as looking for pests, watering plants and pulling weeds. 7 out of 12 farmers helped prepare and mix pesticides before they were applied. This shows that women can be at risk of exposure to pesticides if they participate in agricultural activities, especially during pregnancy. Therefore, research related to pesticide exposure needs to be carried out to determine its effect on the incidence of LBW, especially in Sembalun District, East Lombok Regency.

Methods



This research uses an observational analytic approach with a *cross sectional* study design. The population of this study were women who worked as shallot farmers and had toddlers aged 1-2 years who were recorded at the Sembalun Health Center. The sample in this study was taken by paying attention to the inclusion and exclusion criteria using the *purposive sampling* technique, so that the sample to be studied amounted to 91 farmers. The research data was taken using a questionnaire by conducting interviews and observations.

Data analysis carried out in this study is univariate analysis to describe the characteristics of respondents, bivariate analysis using *chi square* test ($\alpha = 0.05$) to determine the factors of pesticide exposure that have an influence on the incidence of LBW and multivariate analysis using multiple logistic regression test to determine factors Pesticide exposure is the most dominant influence on the incidence of LBW.

Results

Frequency Distribution of Research Variables

This study was conducted to determine the effect of pesticide exposure on shallot farmers during pregnancy and the incidence of LBW in Sembalun District, East Lombok Regency. The variables studied included the incidence of low birth weight, agricultural activities, working period, length of work, pesticide storage, pesticide dosage and storage of shallots and the use of PPE.

Table 1 shows that the number of babies with low birth weight at birth is 42 people. Respondents with risky agricultural activities were 51 people (56%), working period of more than 5 years were 62 people (68.1%), working hours of more than 5 hours were 33 people (36.3%), respondents who kept There were 59 people (64.8%), who used the pesticide dose not according to the rules, 63 people (69.2%) and 65 people (71.4%) who kept shallots indoors. respondents who wore incomplete PPE were 53 people (58.2%).



Table 1. Frequency Distribution of Research Variables

Variable	Information	freq	Percentage
LBW incident	Yes	42	46.2
Agricultural activity	at risk	51	56
Years of service	Old (>5 years)	62	68.1
Length of working	Length (>5 hours)	33	36.3
Pesticide storage	Bad (in the house)	59	64.8
Pesticide Dosage	It is not in accordance with	63	69.2
Onion storage	Bad (in the house)	65	71.4
Use of PPE	Incomplete	53	58.2

Table 2. Bivariate Analysis of Variables Affecting Events LBW in Sembalun District

No	Variable	p value	RP	95% CI	Information
1	Agricultural activity	0.003	2,153	1.673-9.982	Significant
2	Years of service	0.080	1,716	0.996-6,419	Not significant
3	Length of working	0.579	1,195	0.595-3.308	Not significant
4	Pesticide storage	0.020	2,003	1,285-8,190	Significant
5	Pesticide Dosage	0.044	1,884	1.125-7.639	Significant
6	Onion storage	0.010	2,409	1,470-11,650	Significant
7	Use of PPE	0.001	2,629	2.094-13,496	Significant

Table 2 shows that pesticide exposure variables that are associated or have an influence on the incidence of LBW are agricultural activities, pesticide storage, pesticide dosage, onion storage and PPE use, this is evidenced by the probability value (p-value) <0.05. Meanwhile, the variables



of working period and length of service showed no relationship or no effect on the incidence of LBW as evidenced by the probability value (p-value) > 0.05.

Discussion

The Relationship between Agricultural Activities and the Incidence of LBW

The results of the study regarding the relationship between agricultural activities carried out by mothers during pregnancy and the incidence of LBW in Sembalun District showed a significant relationship based on the probability value ($p\text{-value} = 0.003$) which was smaller than the value of (0.05). Research in Brebes Regency shows that the involvement of pregnant women in agricultural activities has an influence on the incidence of LBW (p-value 0.019) (Sari, 2013). Research conducted by Lentho (2018) also explains that there is a relationship between a history of involvement in agricultural activities during pregnancy and the incidence of LBW (p-value 0.043) (Lentho, 2018).

Women who engage in agricultural activities while pregnant have the opportunity to experience pesticide exposure. Agricultural activities that are directly related to pesticides such as helping to prepare and mixing pesticides, looking for pests and pulling grass when a farmer is spraying in the fields, washing husband's clothes after spraying (Sundani, 2020). Exposure to pesticides can also occur during the initial onion harvest, pesticide residues will be left on onion plants and can lead to exposure to pesticides (Fitriadi, 2016).

Exposure to pesticides experienced during pregnancy can interfere with the growth and development of the fetus that is being conceived, so that babies born have low birth weight. Therefore, during pregnancy, it is better not to carry out agricultural activities that are directly related to pesticides because during pregnancy the baby experiences rapid development of the nervous system, brain and other organs (Zakiyah, 2017).



The Relationship between Work Period and the Incidence of LBW

The results of the study on the relationship between years of service and the incidence of LBW showed that there was no relationship between years of service and the incidence of LBW (p value 0.080). The cause of the absence of a relationship between tenure and the incidence of LBW is because respondents during pregnancy reduce or even do not carry out agricultural activities. The tenure relates to how long a farmer has worked on the farm. This shows that pesticide exposure is not influenced by the working period but rather by the intensity of pesticide exposure (Andarini, 2018). The chance of exposure will increase if someone has been doing agricultural activities related to pesticides for a long time. Thus, there is a buildup of the amount of toxic pesticides in the body which can have negative effects on health.

The Relationship between Length of Work and the Incidence of LBW

The results showed that there was no relationship between length of work and the incidence of LBW (p-value 0.579). The length of work has no relationship with the incidence of LBW because a number of respondents did not carry out agricultural activities for a long time, respondents carried out agricultural activities by reducing the frequency and duration or length of work such as watering plants, looking for pests, pulling grass and cleaning spraying equipment. In addition, respondents also admitted that they did not carry out agricultural activities while pregnant, especially regarding pesticides such as preparing and mixing pesticides because their husbands had done them.

Prolonged exposure to pesticides can increase the amount of pesticides that enter and are in the body. The level of pesticide exposure is influenced by the length of work of farmers, but pesticide exposure is cumulative so that the impact on health is not felt right away (Louisa, 2018). Pesticides enter the body in various ways, including through the skin, digestion and respiration (Tobing, 2021). pesticides that enter and are absorbed in the body will get into the bloodstream and through the placenta and then distributed to the fetus, so the fetus can experience stunted growth and development (Zakiyah, 2017).



The Relationship between Pesticide Storage and the Incidence of LBW

The research conducted showed that there was a relationship between pesticide storage and the incidence of LBW (p-value 0.020). This is in line with previous research by Fatmawati (2016) which stated that pesticide storage had a relationship with the incidence of LBW (p-value 0.001).⁹ Interviews with respondents stated that pesticides that have not been used or have been used are usually stored in the house such as the kitchen and living room. This is because the respondents do not have a special storage area for pesticides. Although some respondents also admitted that they store pesticides outside their homes, such as in plant nurseries, the distance between these locations and their homes is still close.

Pesticides stored in the house can cause pesticide exposure, especially if the pesticide is in powder form and is exposed to the wind, it will fly and be inhaled by people around (Fatmawati, 2016). Storage of pesticides must meet the requirements, among others, stored in a special room that has ventilation and is kept out of reach of children, stored in original packaging and protected from direct sunlight, and separated from food storage warehouses (Mahyuni, 2015).

Relationship between Pesticide Dosage and LBW Kejadian Incidence

The research conducted showed that pesticide dose had a relationship with the incidence of LBW (p-value 0.044). Habits carried out by farmers as an effort to suppress the incidence of pests and plant diseases are by increasing the dose of pesticides used (Saputri, 2018). The addition of doses is usually done when the pest explosion cannot be controlled with standard doses, especially during the rainy season, causing the use of pesticide doses that are not in accordance with the rules on the pesticide packaging label. Farmers usually measure pesticides using inappropriate measuring tools such as using pesticide packaging lids or using tablespoons, even some farmers do not use measuring devices but mix or pour pesticides directly with their own estimates. The danger of poisoning due to the use of pesticides is a risk that can be caused by the use of pesticide doses that are not as recommended. According to the *World Health*



Organization (WHO), it is estimated that as many as 3 million incidents of pesticide poisoning per year are experienced by individuals working in agriculture with a death rate of 250,000 people (Faidah, 2017). Therefore, to minimize the health risks that can be caused by exposure to pesticides, farmers should always pay attention to the instructions for use of pesticides, especially regarding the use of the proper dosage according to the rules listed on the pesticide label.

The Relationship between Shallot Storage and LBW Kejadian Incidence

The research conducted showed that onion storage had a relationship with the incidence of LBW (p-value 0.010). The cause of the relationship between the storage of shallots with the incidence of LBW is because most of the respondents in this study kept the shallots from agriculture in the house such as in the kitchen and living room. Respondents store shallots at home because they do not have a special storage area to store shallots from agriculture. Storage of shallots in the house can cause pesticide exposure for people who are in the house, especially for women who are pregnant due to pesticide residues that are still attached to the shallot plants. The condition of shallots that are easily attacked by pests makes spraying pesticides by farmers more than 2 times a week, even in the rainy season it can be done more than 2 times a day (Budiawan, 2014). In addition, in its application, pesticides are also often added along with an adhesive so that the pesticide does not easily dissolve when exposed to rain (Narwanti, 2012). Therefore, red onion crops should be kept outside the house to avoid the risk of exposure to pesticides.

The relationship between the use of personal protective equipment (PPE) and the incidence of LBW

The research conducted showed that the use of PPE had an effect on the incidence of LBW (p-value 0.001). This study is in accordance with what was done by Sundani (2020) that the use of PPE has an influence on the incidence of LBW (p-value 0.025). The amount of pesticides that enter and be absorbed by the body is influenced by the use of incomplete PPE, so that pesticides can easily enter through the skin, eyes, mouth and respiratory tract (Zakiyah, 2017). Masks and gloves are two types of PPE that are rarely used because they have been used to not wearing them for a



long time so that if they are used during agricultural activities, they will feel uncomfortable or uncomfortable and feel that they can interfere with their work.

PPE is very important to wear when carrying out various agricultural activities, especially those related to pesticides to protect themselves from exposure to pesticides. Complete PPE, namely wearing a minimum of a mask, head cover, gloves, long sleeved shirt and long pants (Budiawan, 2014). The use of PPE can reduce the risk of pesticide exposure by around 20% when wearing a mask, 15% when wearing a long sleeved shirt, long pants and boots, 10% when wearing a headgear and goggles (Agustina, 2018).

The habit of farmers who do not wear complete PPE is because they are used to doing agricultural activities without complete PPE and consider the dangers of pesticides as a minor problem, so that farmers do not prioritize personal safety (Istianah, 2017). Incomplete use of PPE can lead to pesticide exposure that has a negative impact on health such as poisoning, hypertension and skin sensitivity disorders as well as the incidence of early menopause. Therefore, it is very important to always pay attention to the completeness of PPE when carrying out agricultural activities related to pesticides, especially for women who are pregnant even though their use interferes with comfort at work, but by wearing complete PPE, the risk or adverse impact of pesticide exposure on individuals can be reduced. .

Pesticide Exposure Factors that Most Dominantly Affect the Incidence of LBW

Multivariate analysis with multiple logistic regression was used to determine the pesticide exposure factor that had the most dominant relationship with the incidence of LBW. Multivariate analysis was carried out simultaneously on more than two variables.

Table 3 Results of Multivariate Analysis

No	Variable	B	p-value	OR (95% CI)
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1	Agricultural Activities	1,437	0.006	4,210 (1,515-11,701)
2	Pesticide Storage	1.154	0.035	3,171 (1,084-9,277)
3	Onion Storage	1.413	0.022	4,107 (1,229-13,720)
4	Use of PPE	1.535	0.004	4,641 (1,645-13,093)

Based on the results of multivariate analysis, it was found that the variables that had a significant relationship or influence on the incidence of LBW were agricultural activities, pesticide storage, shallot storage and the use of PPE as evidenced by a probability value of <0.05 .

Table 3 shows that the use of PPE is the most dominant pesticide exposure factor affecting the incidence of LBW with a probability value ($p\text{-value} = 0.004$) and an *Odds Ratio* (OR) value of 4.641, meaning that shallot farmers who do not wear complete PPE have a risk of giving birth to LBW babies. 4.6 times greater than those wearing full PPE. Therefore, to reduce the amount of pesticides that enter the body through the respiratory, digestive and skin routes, farmers should use minimal PPE such as head coverings, masks, gloves, long sleeves and long pants.

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Conclusion and Recommendation

Based on the results of the study, it can be concluded that the variables or factors of pesticide exposure that have been shown to have an influence on the incidence of LBW include agricultural activities, pesticide storage, pesticide dosage, shallot storage and the use of PPE. The results of multivariate analysis showed that the use of PPE is a pesticide exposure factor that has the most dominant influence on the incidence of LBW.

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