Article

Association of Pesticides Exposure with Breast Cancer in West Sumatera Province, Indonesia

Yuniar Lestari[1], Rima Semiarty[2], Wirsma Arif Harahap[3]

[1]Department of Public Health and Community Medicine, Faculty of Medicine, Universitas Andalas, Padang, Indonesia
[2]Department of Public Health and Community Medicine, Faculty of Medicine, Universitas Andalas, Padang, Indonesia
[3]Department of Surgical Oncology, Faculty of Medicine, Universitas Andalas, Padang, Indonesia

A B S T R A C T

Breast cancer cause multifactorial, one of the risk factors is exposure of pesticides.The aim of this study was to determineassociation of pesticides exposure with breast cancer in West Sumatera Province, Indonesia. In this cross sectional study, the data were collected from Dr. M Djamil General Hospital Padang. Sampling technique with convenience sampling. We selected 234 patients with breast cancer diagnosed. The variables of this study included independent variable is exposure pesticides and dependent variable is breast cancer.Pesticides exposure were collected from the questionnaire of pesticides exposure that have been validated. The association was analyzed by using chi-square test and cut off point analyzed using receiver operating characteristics (ROC). A two-tailed *P*-value of <0.05 was considered statistically significant. Data were analyzed using the SPSS version 22.0. The results of study found that more than half of respondents (53.8%) were exposed of pesticides while less than half of respondents (46.2%) were not exposed. This study confirmed no association of pesticides exposure with breast cancer in West Sumatera Province, Indonesia.

I. INTRODUCTION

Breast cancer is the most frequent type of cancer found in women worldwide. It is estimated that 11.6% or 2,088,849 new cases and 6.6% or 626,679 cases are predicted to end with mortality with this cancer (Bray et al., 2018).In Indonesia, there are 39,831 new cases of breast cancer every year. Hospital Information System in 2013 reports an incidence rate of 40/100,000 women. In 2009, breast cancer is the leading cause of death due to carcinoma disease hospitalized (Harahap et al., 2017; Nindrea et al., 2017; Nindrea et al., 2018).

Breast cancer is a heterogeneous tumor that has various subtypes with different biological behaviors and clinicopathological and molecular characteristics (Carey et al., 2006). In the last

20 years, there has been an increase in the understanding of multistep carcinogenesis and the leading role of genetic change in the diagnosis, treatment and prevention of breast cancer. This leads to an increase in prevention, detection and treatment strategies in breast cancer patients. Breast cancer cause multifactorial, one of the risk factors is exposure of pesticides. Previous study found an association of exposure of pesticides for breast cancer (Jones et al., 2005). Another study found there is no relationship between exposure of for breast cancer (Tyrer et al., 2004).This study found the role of pesticides with the incidence of breast cancer is still controversial. The aim of this study was to determineassociation of pesticides exposure with breast cancer in West Sumatera Province, Indonesia.

II. METHODS

In this cross sectional study, the data were collected from Dr. M Djamil General Hospital Padang. Sampling technique with convenience sampling. We selected 234 patients with breast cancer diagnosed. The variables of this study included independent variable is exposure pesticides and dependent variable is breast cancer.Pesticides exposure were collected from the questionnaire of pesticides exposure that have been validated. This study was approved by the Ethical Committee of Medical Faculty, Universitas Andalas with registration number 612/KEP/FK/2018.The categorical variables were recorded as frequency and percentage. The association was analyzed by using chi-square test and cut off point analyzed using receiver operating characteristics (ROC).A two-tailed P-value of <0.05 was considered statistically significant. Data were analyzed using the SPSS version 22.0.

III. RESULT

Characteristic of respondents (Table 1)

Tabel 1.Characteristic of respondents

Variables	n	%
Stage		
Advance	150	64.1
Early	84	35.9
Histology type		
Invasive ductal carcinoma	126	53.8
Invasive lobular carcinoma	88	37.7
Others	20	8.5
Education		
Low	34	14.5
High	200	85.5
Occupational		
Working	128	54.7
Not working	106	45.3
Family history		
Yes	24	10.2
No	210	89.8
Marital status		
Marriage	34	14.5
Not marriage	200	85.4
Breastfeeding		
Exclusive	82	35.0

Not exclusive	152	65.0
Obese		
Not obese	120	51.3
Obese	114	48.7
Oral contraceptive		
Yes	34	14.5
No	200	85.5

Based on table 1 showed the stage of breast cancer is mostly in the advanced stages (64.1%) than early stages (35.9%). The most common type of histology found in breast cancer sufferers is invasive ductal carcinoma (53.8%). The occupational status of breast cancer sufferers is not working (54.7%) and working (45.3%).

Based on the level of education of breast cancer patients have a high categorized education level of (85.5%) than low education level (14.5%). According to the theory that there is a history of breast cancer in the mother will have the potential to get breast cancer, from the available data, breast cancer is due to a history of breast cancer (10.2%) and no history (89.8%). The same thing also happens to the theory that if there is a history of breast cancer in grandmothers it will potentially get breast cancer because this is still a lineage with the mother. More than half of respondents were married (85.4%), exclusively breastfeeding (65.0%), obese (48.7%) and use of oral contraceptives (14.5%).

The description of pesticide exposure in female breast cancer patients (Table 2).

Table 2.The Description of Pesticide Exposure in Female Breast Cancer Patients

Pesticide exposure	f (%)
Exposed	126 (53.8)
Unexposed	108 (46.2)

Table 2 showed that more than half of respondents (53.8%) were exposed to pesticides while less than half of respondents (46.2%) were not exposed.

The association of pesticide exposure for breast cancer, by knowing the cut off point to distinguish respondents exposed or unexposed through scoring on a research questionnaire using the receiver operating characteristic (ROC) test (Figure 1).
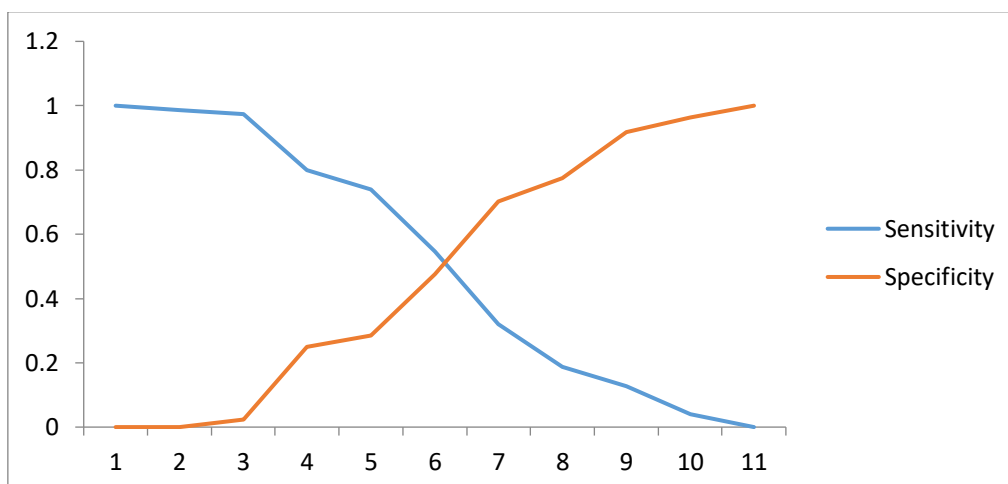

Figure 1.Cut off point to distinguish respondents exposed or unexposed through scoring on a research questionnaire using the ROC test

Figure 1 showed the optimal cut off point at the intersection of sensitivity and specificity to determine the cut off point for classification of pesticide exposure is at the intersection point 6. The cut off point value of the optimal cut off point for sensitivity and specificity intersection (Table 3).

Table 3.The cut off point value of the optimal cut off point for sensitivity and specificity intersection

No	Cut off point	Sensitivity	1 – Specificity	Sensitivity	Specificity
1	0	1	1	1	0
2	1.5	0.986666667	1	0.986666667	0
3	2.5	0.973333333	0.976190476	0.973333333	0.02381
4	3.5	0.8	0.75	0.8	0.25
5	4.5	0.74	0.714285714	0.74	0.285714
6	5.5	0.726666667	0.323809524	0.746666667	0.68619
7	6.5	0.32	0.297619048	0.32	0.702381
8	7.5	0.186666667	0.226190476	0.186666667	0.77381
9	8.5	0.126666667	0.083333333	0.126666667	0.916667
10	9.5	0.04	0.035714286	0.04	0.964286
11	11	0	0	0	1

Table 3 showed the cut off point value of pesticide exposure classification is at a cut-off point of 5.5 (fulfilled 6), then the determination of classification can be explained as follows:
    a. Subjects experienced pesticide exposure, if the total score was ≥ 6
    b. Subjects were not exposed to pesticides, if the total score <6
This classification cut-off point has a sensitivity of 74.6% and a specificity of 68.6%. The accuracy of the cut off point for classifying pesticide exposure (Figure 2).

ROC Curve
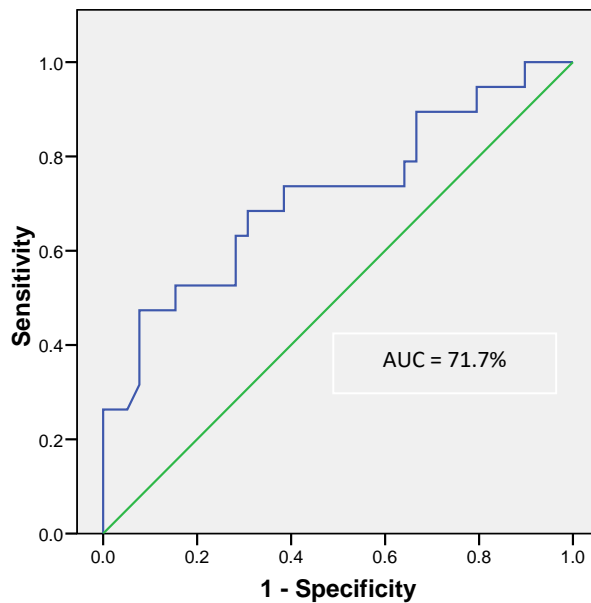
Diagonal segments are produced by ties.

Figure 2.The accuracy of the cut off point for classifying pesticide exposure

Figure 2 based on the results of the receiver operating curve (ROC) analysis having an area under curve (AUC) value of 71.7% which means that the cut off point for classifying pesticide exposure is that the total score ≥ 6 has a pretty good accuracy in predicting pesticide exposure.
Association of pesticides exposure with breast cancer in West Sumatera Province, Indonesia (Table 4).

Table 4.Association of pesticides exposure with breast cancer in West Sumatera Province, Indonesia

Pesticide Exposure	Breast Cancer				Total		p value
	Advanced		Early				
	f	%	f	%	f	%	
Exposed	82	65.1	44	34.9	126	100	
Unexposed	68	63.0	40	37.0	108	100	0.842
Total	150	64.1	84	35.9	234	100	

Based on table 4 known that respondents who were exposed to pesticides were more in patients with advanced stage of breast cancer (65.1%) compared to those unexposed (63.0%). Statistical test results obtained p = 0.842 (p> 0.05) meaning that there is no significant association between pesticide exposure and breast cancer in women.

IV. DISCUSSION

The results of study found that more than half of respondents were exposed of pesticides while less than half of respondents were not exposed. This study confirmed no association of of pesticides exposure with breast cancer in West Sumatera Province, Indonesia.
Pesticides are substances that are used to kill or eradicate various pests. The word pesticide comes from the word pest which means pest and cida which means to kill. The United States Environmental Control Act defines pesticides as all substances or mixtures of substances specifically used to control, prevent or fend off insects, rodents, nematodes, weeds, viruses, bacteria and pests. Pesticide exposure to humans can be through several ways including through drinks, food or work and through routes such as oral, dermal or inhalation. The risk of exposure is very dependent on the manner and route as well as the frequency, duration and chemical category of the pesticides used (Maas et al., 2016).

It is suspected that environmental factors that play a role in causing breast cancer are organochlorine pesticides because of its nature as an endocrine disruptor that specifically has effects such as estrogenic or anti-estrogen (xenoestrogen), as well as biochemical characteristics that are lipophilic and resistant to biotranformation. Because of its lipophilic nature, these chemicals tend to accumulate through the food chain into the human body, including adipose tissue, fat tissue, breast milk or serum in the form of exposure to organochlorine pesticides or the chemical industry will likely play a role in breast cancer. The presence of estrogen in pesticides is thought to cause an increase in cell proliferation. Several studies have reported a positive relationship between exposure to Dichlorodiphenyldichloroethylen (DDE) with the risk of breast cancer. An increase in DDE and polychlorinated biphenyls (PCBs) in the blood of breast cancer patients (Anders et al., 2009).
Assessment of the factors that cause breast cancer is one of the answers because until now it has not been found a certain cause of breast cancer. One risk factor for which accurate data have not been obtained regarding its effect on breast cancer incidence is exposure to pesticides. Pesticides can affect or initiate tumors, carcinogens, mammary glands, the body's immune system,

communication between cells, the endocrine system and other body mechanisms. This condition causes stimulation of breast cells which triggers breast tissue proliferation and affects the incidence of breast cancer (Nindrea et al., 2018; Nindrea et al., 2019).

This study suggests to efforts should be made to avoid the use of pesticides both on an agricultural scale by switching to the use of organic materials and household scales by consuming organic food and the use of similar compounds to eradicate pests and insects at home. For the visible proportion of breast cancer occurring in this study at an advanced stage, it is necessary to encourage regular breast self-examination (BSE) in women who are entering their twenty years old. For women entering menopause, breastfeeding can be done 7 days after monthly menstruation. Entering the age of 20-30 years should do a clinical breast exam (CBE) or breast examination clinically and regularly recommended every 3 years. After entering the age of 40 years women should do a breast examination by a health professional every year and women aged 40 years and over should do a mammogram every year and regularly.

V. CONCLUSION

The results of study found that more than half of respondents (53.8%) were exposed to pesticides while less than half of respondents (46.2%) were not exposed. This study confirmed no association of of pesticides exposure with breast cancer in West Sumatera Province, Indonesia.

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BIOGRAPHY

First Author Dr. dr. Yuniar Lestari, M.Kes, Medical Doctor graduated from Faculty of Medicine Universitas Andalas, Master Degree at Faculty of Medicine Universitas Gadjah Mada, Doctoral Program of Biomedicine at Faculty of Medicine Universitas Andalas.

Second Author Dr. dr. Rima Semiarty, MARS, Medical Doctor graduated from Faculty of Medicine Universitas Andalas, Master Degree at Faculty of Medicine Universitas Indonesia, Doctoral Program of Public Health at Faculty of Medicine Universitas Andalas.

Third Author Dr. dr. Wirsma Arif Harahap, Sp.B (K) Onk, Medical Doctor graduated from Faculty of Medicine Universitas Andalas, Surgical specialist at Faculty of Medicine Universitas Andalas, Surgical oncology sub-specialist at Faculty of Medicine Universitas Indonesia, Doctoral Program of Biomedicine at Faculty of Medicine Universitas Andalas.