

Effect of Agricultural Pesticide Exposure to Malaria Incidence and Anopheles Susceptibility in Endemic Area in Central Java

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BACKGROUND

Malaria is a zoonotic disease caused by Plasmodium sp. which often occurs in tropical countries and sometimes in agriculture countries. Pyrethroid known as chemical used in household or agricultural pesticide prayer to control insect included mosquito.¹ Anopheles gambiae uses agricultural land as a breeding place where is exposed to pesticides frequently. Research in Benin shows Anopheles gambiae resistant of DDT and pyrethroid, while in a region of Parakuo found the Anopheles Gambia mutationin about 82.2%.² Purworejo District known as malaria endemic area in Central Java which main occupation were farming. This condition sets a potential usage of agricultural insecticide.³ Those condition may lead to malaria endemic factor in Purworejo District. This research aimed to explain causal effects of agricultural pesticides exposure to malaria incidence and Anopheles susceptibility in endemic area.

METHOD

A case-control study performed between September to October 2016 in Purworejo. The case group were 131 persons who suffered from malaria during 2016 by medical record, while the control group were 131 persons of cases neighbor who never suffered malaria along their life. Both case and control group were interviewed used same questionnaire. Mosquito samples collected by 10 persons in Turus Wetan Village and Plipir Village which newest cases appeared. Mosquitoes were performed insecticide susceptibility test.

RESULTS AND DISCUSSION

Logistic regression of agricultural pesticide quantity remains a potential health risk to malaria (OR=2.15; 95% CI 1.000-4.638) adjusted by confounders (gender, resting place, and insecticide net) (Table 1).

Table 1. Agricultural Pesticide Exposure to Malaria

Variabel	OR	Std. Error	Z score	Nilai p	95% CI	
					Lower	Upper
Agricultural Pesticide	2.15	0.84	1.96	0.050	1.000	4.638
Gender	1.96	0.55	2.43	0.015	1.139	3.391
Resting Place	1.94	0.88	1.45	0.147	0.793	4.723
Insecticide net	0.18	0.06	-4.65	0.000	0.085	0.367

Table 2.Observations Results of Susceptibility Test on Mosquitoes Using Permethrin

Observing time	Tube 1	Tube 2	Tube 3	Tube 4	Control (+)	Control (-)
11.00	15	12	13	12	20	20
12.00	14	13	15	14	20	20
13.00	14	13	15	14	20	20
14.00	16	15	15	16	20	20
15.00	16	16	16	16	20	20
16.00	16	18	17	16	20	20
22.00	16	18	17	16	20	20
10.00	17	18	18	16	20	20
Mosquitoes survive	3	2	2	4	20	20

Susceptibility test indicated Anopheles mosquito tolerant of permethrin insecticide (86.25%), but already resistant of bendiocarb (68.75%) from 80 samples. Use of insecticides in agriculture has been linked to resistance in malaria vectors.⁴ The results of this study are consistent with studies conducted in other countries. The use of pesticides is not appropriate dose, will exerting pressure on a huge selection of mosquito larval population, the which resulted to the emergence of insecticide resistance in malaria vectors.⁵⁻⁶ Literature study in 23 of the 25 relevant recent publications from across Africa, higher resistance in mosquito populations was associated with agricultural insecticide use. Mosquito can become exposed to insecticides used in agriculture from contamination of nearby breeding sites, and while it is difficult to delineate the effect of this early exposure in terms of adult resistance in vivo.^{7,8}

CONCLUSIONS AND RECOMMENDATION

Agricultural pesticide quantity found as risk factor to malaria incidences and Anopheles in Purworejo indicated as resistant to bendiocarb by insecticide susceptibility test.

Keywords : agricultural pesticide, anopheles, malaria, resistant

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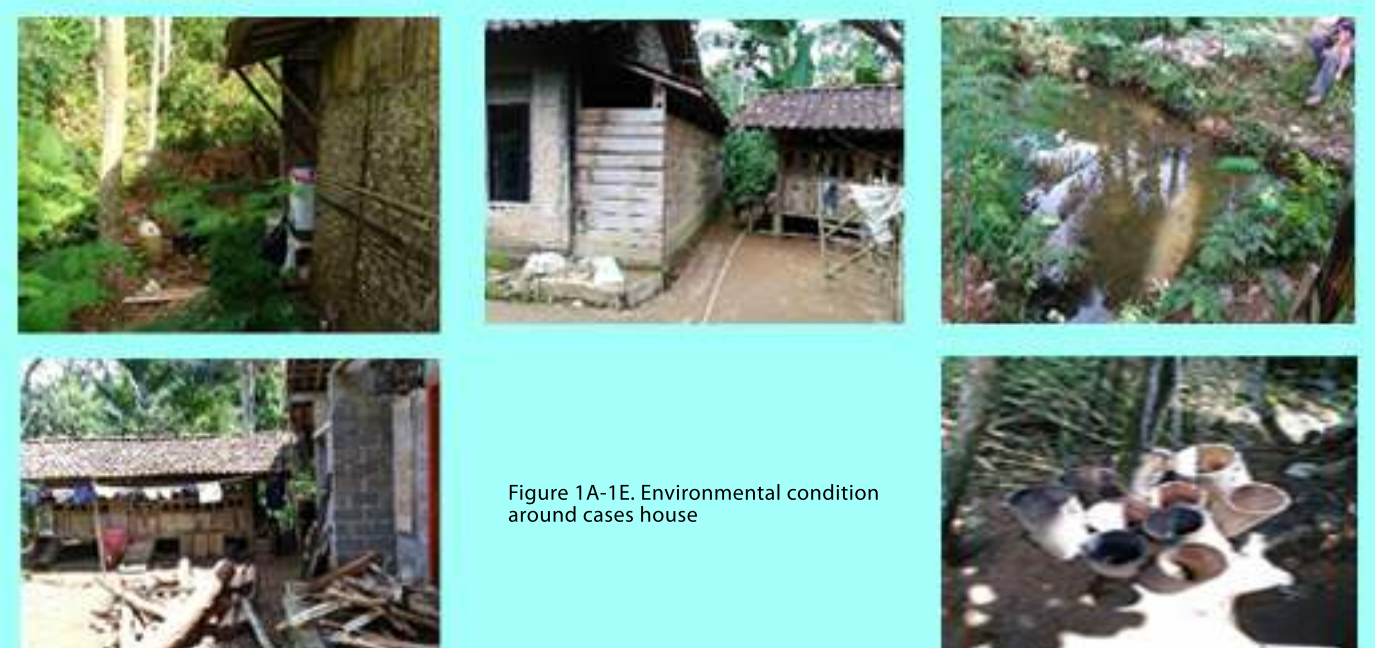


Figure 1A-1E. Environmental condition around cases house