



## CHANGES IN KNOWLEDGE, BEHAVIOR, AND ENVIRONMENTAL CONTROL FOR FILARIASIS PREVENTION WITH “MANDIRI” POCKET BOOK IN PEKALONGAN CITY SOCIETY: A LONGITUDINAL STUDY

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### ABSTRACT

Mass Drug Administration (MDA) coverage for filariasis in Indonesia increased from 37.7% in 2011 to 73.9% in 2014. In contrast, filariasis case increased from 11,902 in 2012 to 14,932 in 2014. Pekalongan City has the highest number of filariasis cases in Central Java, Indonesia. The city has been implementing MDA but it has not decreased the filariasis case numbers. Pekalongan City society's knowledge and participation in filariasis elimination efforts were still in the low level. Reading can increase knowledge and influence behavior. Changing certain behaviors is a complex matter that takes a long time. This study is aimed to assess the changes in knowledge, behavior, and environmental control in the filariasis prevention by implementing “MANDIRI” Pocket Book for three years (from 2015 to 2017). This research is a quasi-experiment one with randomized control group pretest-posttest design, done in 2 villages of Pekalongan City. “MANDIRI” Pocket Book Program was able to achieve proper results in 6 months (April-September 2016). This study proves that the proper results were persistent in the following 9 months (July 2017). Compared to that of the control group, the result of the experiment group shows an improvement in knowledge, repellent application behavior, night outdoor behavior, and indoor environmental control.

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Keywords: filariasis prevention, knowledge, behavior, environmental control, “MANDIRI” Pocket Book

### INTRODUCTION

Filariasis (elephantiasis) is an infectious disease caused by filaria worms which attack the lymph channels and nodes. They enter human body through the biting of various mosquitoes (WHO, 2013). In 2004, filariasis infected 120 million people in 83 countries, especially the tropical and subtropical regions. Indonesian Health Ministry reported that filariasis has spread in In-

donesia, from Sumatra, Java, Kalimantan, Sulawesi, Nusa Tenggara, to Papua. It was reported that 11,914 clinical cases spread in 401 regencies/cities in 2009. The coverage of Mass Drug Administration (MDA) for filariasis in Indonesia increased from 37.7% in 2011 to 73.9% in 2014. In contrast, filariasis cases increased from 11,902 cases in 2012 to 14,932 cases in 2014.

Central Java Health Office reported that Pekalongan City has the highest number of filariasis cases in Central Java, Indonesia. In 2010, in Central Java, there were 451 cases spread across

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25 regencies/cities and there were 2 endemic regencies/cities, i.e. Pekalongan Regency and Pekalongan City. The number of filariasis case in 2011 was 537. 141 of them were new cases, 125 of which were found in Pekalongan City, while the rest spread over 8 regencies/cities. Pekalongan City applied MDA in 2011-2015 but it has not decreased the number of filariasis cases and the rate of *Microfilaria* (Mf-rate) yet. Based on WHO's guidance, an evaluation should be done after applying MDA for 5 years. The evaluation will determine whether the MDA needs to be continued (WHO, 2010). The evaluation result in the end of 2015 stated that Pekalongan City had to continue MDA for the next two years. Pekalongan City's failure in decreasing the number of cases and the Mf rate with only 5 year MDA could be caused by environmental condition, vector density, and filariasis prevention behavior. A preliminary study shows that Pekalongan City has a potential environment for filariasis transmission and people who lack of knowledge about filariasis (Indarjo et al., 2016).

MDA should be strengthened by controlling environment, vectors, and community participation to optimize filariasis elimination (Nwoke et al., 2010, Upadhyayula et al., 2012). The preliminary study shows that paddy fields, swamps, bushes, and uncovered pooled sewerages were easily found in Pekalongan City. They are suitable for mosquito breeding and resting places. Poor environmental sanitation affects the availability of breeding places and resting places for filariasis vectors (mosquitoes) (WHO, 2010). Syuhada et al. (2012) show that the presence of sewerages, puddles, bushes, and swamps can become risk factors for the incidence of filariasis. In Pekalongan City, swamps may include natural swamps, tidal flood, and rice fields. Pooled sewerages were found in almost every roadside in Pekalongan City. These sewerages are suitable for breeding places of *Culex quinquefasciatus*, the main vector of filariasis in Pekalongan City (Windiastruti et al., 2013). The condition becomes worse since Pekalongan City is located next to Pekalongan Regency which is also a filariasis endemic area.

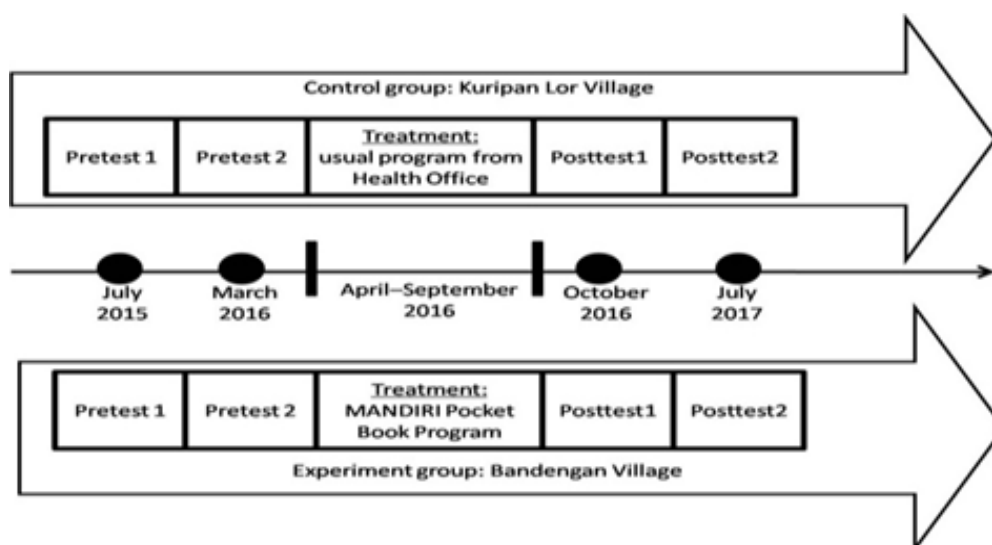
Besides those environmental problems, it was found that some people refused to take the MDA medication, and some others postponed taking it. Pekalongan City Health Office reported that in 2011, there were 10,109 people who did not take the MDA medication and 36,037 people postponed taking the MDA medication. Whereas in 2012 8,479 people did not take the MDA medication and 30,906 people postponed taking

it. Several studies on Pekalongan City found that people's lack of knowledge about filariasis, filariasis prevention efforts, and MDA were the background of neglecting the environment and not taking the MDA medication (Windiastruti et al., 2013; Indarjo et al., 2016; Wulandhari & Pawenang, 2017; Khikmah & Pawenang, 2017; Ginandjar et al., 2017). The society's behavior in not using mosquito net when sleeping, not using repellent, and having night outdoor activities will increase the probability of being bitten by various mosquitoes which will inject filaria worms into their bodies (Nwoke et al., 2010; Syuhada et al., 2012; Upadhyayula, 2012). The behavior of not taking the MDA medication will decrease their opportunities of being prevented from filariasis. The MDA, which contains DEC (*Diethyl Carbazazine Citrate*) and Albendazole, will execute filaria worms in the human body before an enlargement stage. Body parts enlargement because of lymph channels and nodes obstruction by filaria worms will occur after decades of filaria worm infection. Most people will not realize that filaria worms are already injected into their bodies by mosquitoes before the enlargement stage. Taking the MDA medication before enlargement stage is an effective way to prevent from disability caused by filarial body parts enlargement (World Health Organization, 2013). Filariasis is spread by various mosquitoes which can breed in both clear water and sewerage water, bite on both daytime and night, and prevail in both indoor and outdoor habitats. Indoor environment control can be done by draining and cleaning water containers, putting lid on water containers, placing larvae predatory fish in water containers, doing larvae monitoring regularly, etc. Outdoor environment control can be done by burying odds and ends, tidying up the scrubs and other plants, keeping sewerages clean and flow properly, placing fish in rice field puddles, draining tidal flood, etc. Indoor and outdoor environment control will decrease the presence of mosquitoes' breeding and resting places. It will decrease the population of mosquitoes (Syuhada et al., 2012; Upadhyayula, 2012; Windiastruti et al., 2013). Behavior changes will be more permanent if it is backed up by adequate knowledge. Cognitive aspects have an important role for deep understanding of new information that will result in motivation and behavior changes (Craig et al., 2013). Some studies have proven the effectiveness of education in changing knowledge and behavior in health, environment, and safety (Beyazit & Ayhan, 2019; Jafaralilou et al., 2019; McDonnell et al., 2019; Baumgartner et al., 2019; Hamilton et al., 2019; Pansu et al., 2019;

Winarto et al., 2018). It is necessary to create methods, strategies, and appropriate media to educate people about filariasis prevention efforts and MDA in Pekalongan City (Ginandjar et al., 2017, Abraham et al., 2014, Banerjee et al., 2013).

This study chose “MANDIRI” Pocket Book as media. “MANDIRI” is an abbreviation of “*Media Baca Hindari Filariasis*” which means “Reading Media of Filariasis Prevention”. “MANDIRI” itself means “be autonomous”. This pocket book contains textual information with some illustration images about filariasis, filariasis prevention efforts, and MDA. Dwianto et al. (2017) have proven that using some tools based on local wisdom could effectively improve science processing skills and scientific attitudes. Some pictures and textual contents in “MANDIRI” Pocket Book were taken from real local condition in Pekalongan City in order to make comprehension easier. Visual contents mostly dominate the guidance to human cognition (Bochicchio et al., 2018; Baumgartner et al., 2019). Printed media are able to display integrated textual visual contents that can be

seen or read repeatedly without experiencing a reduction in information so that it will lead to more uniform perceptions in a large number of readers (Jibril, 2017). Printed media as well as digital media still have an important role in forming audience’s perception. It can produce similar perception on a lot of readers. Mangen et al (2019) have proven that both printed pocket book and Kindle (digital-internet based media) are good media to deliver information, but those who read printed media were better in performance of understanding. Similar findings have also been reported by Singer & Alexander (2017), Delgado et al (2018), and Mizrachi et al (2018), that more complex contents will be easier to understand through printed media. This kind of media was chosen because Pekalongan City has low illiteracy rate. Pocket books have been reported to result in knowledge and behavior changes in some studies (Wilkinson et al., 2010; Winarto et al., 2018). “MANDIRI” Pocket Book is simple, reread-able and lendable. “MANDIRI” Pocket Book was created for a year period before and has already had ISBN.



**Figure 1.** The Stages of Treatments and Tests

Some similar studies assessed the changes of knowledge and behavior for only 1 month after treatments (Beyazit & Ayhan, 2019; Jafaralilou et al., 2019). These studies assessed the changes of knowledge and behaviors 3 months after treatment and evaluate its persistence in years. This study is aimed to assess the change of knowledge and behaviors in filariasis prevention with “MANDIRI” Pocket Book Program in 2015-2017.

## METHODS

This research is a quasi experiment one. The control group was treated by the existing program from Pekalongan City Health Office. The experiment group was treated by applying “MANDIRI” Pocket Book through “PKK” program activity. “PKK” stands for “*Pendidikan dan Kesejahteraan Keluarga*” or Education and Welfare for Families. “PKK” is a kind of social organi-

zation whose members are wives. "PKK" program usually has a monthly meeting. "MANDIRI" Pocket Book Program was implemented by groups in "PKK" program activities. Every group had a "MANDIRI" Pocket Book which would be lent to every member in rotation. "MANDIRI" Pocket Book had been previously created for a

year period through the following stages: (1) need assessment; (2) content editorial; (3) taking indigenous pictures; (4) content, appearance, readability, and cultural conformity validation by experts (by Pekalongan City Health Officers, health experts, communication experts, and psychologists); (5) trials; and (6) revisions.

**Table 1.** Knowledge, Behavior, and Environmental Control of the Control Group and the Experiment Group

Aspects	Test & Time	Pretest 1 2015		Pretest 2 2016		Posttest 1 2016		Posttest 2 2017									
		Control	Experiment	Control	Experiment	Control	Experiment	Control	Experiment								
Aspects		f	%	f	%	f	%	f	%	f	%	f	%	f	%		
Filariasis knowledge	<i>Good</i>	18	40.0	12	17.6	30	40.5	18	24.0	8	1.1	36	48.0	39	52.0	38	63.3
	<i>Poor</i>	27	60.0	56	82.4	44	59.5	57	76.0	66	98.9	39	52.0	36	48.0	22	36.7
MDA knowledge	<i>Good</i>	25	55.6	15	22.1	37	50	22	29.3	31	41.9	44	58.6	36	48.0	46	76.7
	<i>Poor</i>	20	44.4	53	77.9	37	50	53	70.7	43	58.1	31	41.4	39	52.0	14	23.3
Risky night outdoor habit	<i>Do</i>	17	37.8	39	57.4	21	28.4	33	44.0	33	44.6	18	24.0	35	46.7	26	43.3
	<i>Not do</i>	28	62.2	29	42.6	53	71.6	42	56.0	41	55.4	57	76.0	40	53.3	34	56.7
Apply mosquito repellent	<i>Do</i>	20	44.4	44	64.7	44	59.5	55	73.3	39	52.7	64	85.3	38	50.6	46	76.7
	<i>Not do</i>	25	55.6	24	35.3	30	40.5	20	26.7	35	47.3	11	14.7	37	49.3	14	23.3
Using mosquito net	<i>Do</i>	44	97.8	12	17.6	67	90.5	20	26.7	66	98.9	18	24.0	8	4.0	15	25.0
	<i>Not do</i>	1	2.2	56	82.4	7	9.5	55	73.3	8	1.1	57	76.0	67	96.0	45	75.0
Indoor environment controll	<i>Good</i>	11	24.4	53	77.9	33	44.6	9	12.0	28	37.8	35	46.7	35	46.7	26	43.3
	<i>Poor</i>	34	75.6	15	22.1	41	55.4	66	88.0	46	62.2	40	53.3	40	53.3	34	76.7
Outdoor environment controll	<i>Good</i>	19	42.2	21	30.9	33	44.6	7	9.3	22	29.7	8	4.0	47	62.7	24	40.0
	<i>Poor</i>	26	57.8	47	69.1	41	55.4	68	90.7	52	70.3	67	96.0	28	37.3	36	60.0

Control group= Kuripan Lor Village

Experiment group = Bandengan Village

**Table 2.** The Comparisons of P-Value among Tests in Three Years (2015-2017)

Aspects	Control Group			Experiment Group		
	Comparison between pretest 1 and pretest 2	Comparison between pretest 2 and posttest 1	Comparison between posttest 1 and posttest 2	Comparison between pretest 1 and pretest 2	Comparison between pretest 2 and posttest 1	Comparison between posttest 1 and posttest 2
Filariasis knowledge	0.759	0.001*	0.591	0.716	0.001*	0.389
MDA knowledge	0.212	0.977	0.050	0.198	0.002*	0.878
Risky night outdoor habit	1.000	0.060	0.676	0.224	0.016*	1.000
Mosquito repellent application	0.059	0.508	0.493	0.509	0.001*	1.000
The use of mosquito net	1.000	1.000	1.000	0.094	0.001*	0.736
Indoor environment control	1.000	0.025*	0.760	0.645	0.001*	0.336
Outdoor environment control	0.521	0.387	0.254	1.000	0.613	1.000

\* = significantly different

“MANDIRI” Pocket Book was registered with ISBN 978-602-285-265-6. This study took Bandengan Village as the experiment group and Kuripan Lor Village as the control group. The villages were chosen purposively because of their risky condition for filariasis transmissions, such as risky environment condition, risky behavior, and being surrounded by other endemic villages. Pretest 1 was done in July 2015. The program was implemented in April-September 2016, with a pretest in March 2016 (pretest 2) and a posttest in October 2016 (posttest 1). The program was implemented with the accompaniment of the team of researchers for a month, then it was continued naturally by the society. The last posttest was done in July 2017 (posttest 2) to assess the post-program changes in the society. The data were analyzed by using the chi square test and the fisher test. Figure 1 shows the stages of treatment and tests in this study.

## RESULTS AND DISCUSSION

Table 1 shows that the knowledge of experiment group (Bandengan Village) increases from pretest 1 in 2015 to posttest 2 in 2017. The highest knowledge increase in the experiment group occurred after implementing “MANDIRI” Pocket Book Program. It can be identified by comparing the result of pretest 2 with that of posttest 1 in 2016. The same thing also occurred for the risky night habit, repellent application, and environment control both indoor and outdoor in the experiment group. The experiment group had a bet-

ter posttest 1 result in 2016 for all aspects, except on the use of mosquito net. The control group got the opposite condition. The results of posttest 1 of the control group were worse than that of pretest 2 for all aspects. Table 2 shows the comparisons of p-value among tests in three years (2015-2017). The result of pretest 1 were not different from those of pretest 2 in both groups ( $p > 0.05$ ). It implies that the existing programs from Pekalongan City Health Office did not make significant changes in the people’s knowledge and behavior from July 2015 to March 2016. According to Table 1 and Table 2, the result of posttest 1 was significantly better than that of pretest 2 in the experiment group for all aspects, except on the use of mosquito net and outdoor environment control. Pretest 2 on the use of mosquito net in the experiment group was significantly better than that of posttest 1. The result of posttest 1 on the outdoor environment control in the experiment group was insignificantly better than that of the pretest. Both tables indicate that the results of posttest 1 of the control group were worse than those of pretest 2 in all aspects. Some of them got worse significantly. They were filariasis knowledge, attitudes in filariasis elimination, attitude in MDA, and indoor environment control. This result proves that the existing program from Pekalongan City Health Office could not optimally maintain the knowledge, attitude, behavior, and environmental control in the filariasis elimination. It might be caused by the lack of time and quantity of the health officers in educating the people.

**Table 3.** The Comparison of Posttest 1 Results between the Control Group and the Experiment Group in 2016

No	Aspects	Categories	Control Group	Experiment Group	p
1	Filariasis knowledge	Good	8	36	0.001*
		Poor	66	39	
2	MDA knowledge	Good	31	44	0.035*
		Poor	43	31	
3	Risky night outdoor habit	Not do	41	57	0.009*
		Do	33	18	
4	Mosquito repellent application	Do	39	64	0.001*
		Not do	35	11	
5	The use of mosquito net	Do	8	18	0.052
		Not do	66	57	
6	Indoor environment control	Good	28	35	0.009*
		Poor	46	40	
7	Outdoor environment control	Good	22	6	0.001*
		Poor	52	69	



Table 2 also indicates that there were no significant differences between the results of posttest 1 (2016) and those of posttest 2 (2017) both in the experiment and the control groups (Khikmah & Pawenang, 2018). It implies that the condition was persistent in 9 months. It also implies that "MANDIRI" Pocket Book Program was a necessary process which increased the knowledge and behavior of the experiment group. It can be concluded from the difference between the results of pretest 2 and posttest 1 described in Table 1 and Table 2. The comparison of posttest 1 results between the experiment group and the control group is described in Table 3, in which the groups were significantly different in posttest 2 results. Table 3 shows that the experiment group was better than the control group in all aspects except outdoor environment control. As for the use of mosquito net aspect, the experiment group was insignificantly better than the control group. The control group was significantly better than the experiment group only for the outdoor environment aspect. It can be explained by observing the different environment between them. Bandengan Village (the experiment group) usually has tidal flood. It causes a large portion of unsanitary area. It is very difficult for people to get rid of the condition. In contrast, Kuripan Lor Village (the control group) never gets tidal flood. It keeps the environment sanitary (Wulandhari & Pawenang, 2017).

Knowledge is the result of idea, and this presents after people sense a particular object. Sensing is done through the five senses. Cognitive domain knowledge is very important in shaping a person's actions (overt behavior). Behavior that is based on knowledge will be more lasting than one that is not based on knowledge. Before a person adopts new behaviors, a sequential process happens: awareness, interest, evaluation, trial, and adoption. Behavioral changes do not always go through those stages. Behavioral change will last long if it happens because of knowledge, awareness, and positive attitudes. Conversely, when the behavior is not based on knowledge and awareness, it will not last long. Most knowledge is gained by humans through their eyes and ears. Knowledge in the cognitive domain has six levels: knowing, understanding (comprehension), application, analysis, and synthesis. Cognitive domain knowledge is very important for the formation of a person's actions. People who have a good level of knowledge will certainly be more alert to the risk of filariasis by the way of protection me-

asures against filariasis vector's bite when doing night activities and reducing mosquito breeding sites around their environment. Changing behavior is generally more difficult in adult education (andragogy) than in children education (pedagogy). This is understandable because adults have already possessed knowledge, attitudes, and certain skills for many years. Thus, the knowledge, attitudes, and behaviors they do not believe become difficult to accept. Efforts are required in order to learn to believe in the importance of subject knowledge, attitudes, and behaviors for their lives (Craig et al., 2013).

This study has proven that "MANDIRI" Pocket Book can generally increase the knowledge and behaviors in terms of filariasis prevention efforts. Applying "MANDIRI" Pocket Book by lending the book in a rotation system can save time, cost, and quantity of the health officers. It will be very useful because so far the lack of time, cost, and quantity of health officers has always been a problem. Lending the book in a rotation system enables interaction and discussion between the lender and the borrower. It will result in starting the motivation for changing the behaviors. Similar results were also demonstrated by Rahmawati et al. (2016), who revealed that psychoeducation with booklet media and discussions were also influential to cope with anxiety and for parents who have children with acute lymphoblastic leukemia. The process of education with pocket book media is considered effective to increase the knowledge because pocket books can store more information, and can be read repeatedly anytime and anywhere (Craig et al., 2013). In addition, the materials in the pocket books use simple sentences, thus making it easier to understand the message. Pocket books also come with interesting pictures, making it easier to capture, remember, and practice the message in everyday life. From various sources, a large number of studies have shown that people remember 10% of what they read, 20% of what they hear, 30% of what they see, 50% of what they see and hear, 80% of what they hear, see, and are told (Rahmawati et al., 2016). In addition, the medium of learning through a more concrete image can overcome the limitations of space and time and can show appropriate comparisons of the actual objects (Craig et al., 2013).

This study proves that the proper results of knowledge, behavior, and environmental control changes with "MANDIRI" Pocket Book were persistent until the following 9 months. A further

study about its effect to Mf rate and filariasis case number is needed. It is also necessary to design the lending-borrowing route of "MANDIRI" Pocket Book in order to gain a better and wider effect. Those were not studied in this research.

## CONCLUSION

"MANDIRI" Pocket Book Program was able to achieve proper results in 6 months (April-September 2016). This study proves that the proper results were persistent for 9 months later (July 2017). Compared to the control group, the experiment group resulted in the increase in knowledge, repellent application behavior, night outdoor behaviors, and indoor environmental control ( $p < 0.05$ ).

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