

# The Effectiveness of the Si-DBD Application in Increasing the Number of Households in Conducting Periodic Larvae Examination at the Health Center in Bantaeng Regency

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## ABSTRACT

**Background:** Vector-borne diseases, namely DHF, are estimated to infect 100-400 million people each year. Until now there is no specific drug or vaccine for DHF that can be done to avoid or prevent mosquitoes, which focuses on prevention efforts by eradicating mosquito nests. This study aims to see the effectiveness of the application system in carrying out periodic inspections by households. **Method:** Quasi-experimental research type with design "The Nonrandomized Control Group Pretest Posttest Design". There are 112 samples with a ratio of 1:1 treatment (application system) and control (manual). Data collection using observation sheets (secondary data) and data from larvae inspection results through the application. Seeing the difference before and after the Mc test. Neman and Chi-Square to see the difference between the treatment and control groups. **Results:** Periodic larvae inspection by the household before and after manually had no difference, while the system with the application had a significant difference with a value of P=0.000. The comparison between the treatment and control groups with a value of P = 0.000 indicates that there is a difference in the number of households that carry out periodic larva inspections through an application compared to the manual method. The system with the Si-DBD application is simpler, more acceptable, and timelier in carrying out periodic larvae inspections by households with a value of P=0.000. **Conclusion:** The implementation of periodic larvae inspections that is modeled by an application-based information system via a smartphone has an influence on the number of households that carry out larvae inspections compared to the manual system that is running. Follow-up testing can be carried out on a large scale of household respondents covering the entire work area of the health center and with a cohort research design.

**Key words:** Application, Periodic larva inspection, DHF.

## INTRODUCTION

Vector-borne diseases account for more than 17% of all communicable diseases, with viral infections transmitted by vectors, namely the Aedes mosquito which an estimated 100-400 million occur each year.<sup>1</sup> DHF cases in Indonesia will increase again in 2022 (IR 31.38/100,000 population) and 816 deaths (CFR 0.93%).<sup>2</sup> South Sulawesi ranks 10th with DHF cases with an Incidence Rate of 40 per 100,000 population and a CFR of 0.98.<sup>3</sup>

Until now, there is no specific drug or vaccine for the treatment of DHF. What can be done now is to avoid or prevent dengue-carrying mosquito bites.<sup>4</sup> Prevention and control of dengue infection depend on effective vector control measures.<sup>1</sup> Control of DHF in Indonesia is regulated by the Decree of the Minister of Health which focuses on prevention efforts with the mosquito nest eradication movement (PSN).<sup>4</sup> This effort is strengthened through the organization of the Dengue Hemorrhagic Fever Operational Working Group (Pokjanel DHF) and the activities of the Larvae Monitor (Jumantik).<sup>5</sup>

Movement 1 House 1 Jumantik (G1R1J) is community participation and empowerment by involving every family in examining, monitoring, and eradicating mosquito larvae to control vector-borne diseases especially DHF through the cultivation of PSN 3M PLUS, and the head of the family as the person in charge of jumantik at home.<sup>5</sup>

The current implementation of G1R1J activities is not running effectively the implementation process is considered inefficient and time-consuming and the form of reporting the results of larvae inspections given to the puskesmas is always not on time so reporting takes a long time and data on the presence of mosquito larvae in residents' homes is often lost.<sup>6</sup> The study conducted by Margarethy mentioned that one of the main factors influencing the implementation of G1R1J in Jambi City that did not run optimally was the absence of regional regulations/regulations related to the implementation of activities that included funding and community involvement.<sup>7</sup>

Implementation of G1R1J in Kab. Bantaeng has been implemented since 2020 and is still limited to only 2 sub-districts as evidenced by the last SK issued by the City Health Center No.07/PKM-KT/SK/1/2022.<sup>8</sup> G1R1J has not been implemented properly, is still carried out, and is centered on health workers, has not been carried out independently by the community according to the flow and process of its implementation. Special methods and strategies are needed to facilitate the implementation of activities, by developing the implementation process using a webpage-based information system and mobile smartphone.

The development of a health information system based on the use of an application can help to facilitate the implementation of activities and avoid delays as well as save costs and time. Research by

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Cano *et al.*, in Spain, proves that the empowerment of residents and patients towards an active role in disease prevention and management is carried out through the DHF application.<sup>9</sup> Research conducted in Indonesia by Khozaimi that the "Dengue Alert" application is acidic in 97.6% of cases of dengue fever, at this ease can be detected early.<sup>10</sup>

Eradication of mosquito nests through the larva monitoring program has long been carried out and developed. Research by Akbar, namely the development of the M-Jumantik mobile application facilitates coordination between the community and Jumantik puskesmas officers in conducting periodic larva monitoring during the Covid-19 pandemic.<sup>11</sup> Research by Sugeng *et al.*, in the development of a webpage-based Jumantik information system (Simpatik) at the puskesmas, can maximize the accuracy of information and save time in preparing reports.<sup>12</sup>

Based on the results of research that has been done previously that the use of applications related to DHF and in particular the implementation of larva monitoring is already available, but it is still complicated to use for the general public because the application is aimed only at trained larvae and puskesmas officers. The information system based on the Si-DBD android application is directly connected to puskesmas reporting without going through the intermediary of jumantik coordinators and supervisors, making it simpler, more practical, easier to use, and sustainable because this application supports the national program of the 1 house 1 jumantik movement. The Si-DBD application is aimed directly at households in carrying out periodic weekly inspections of larvae for the implementation of G1R1J activities independently.

## RESEARCH METHODS

This research is a type of Quasi-Experimental research with a design using "The Nonrandomized Control Group Pretest Posttest Design", namely there are two groups, the treatment (using the Si-DBD application) and the control group, both of which were not randomly selected. This research was conducted in Pallantikang Village, the working area of the Bantaeng City Health Center, and was carried out from 01 February to 30 April 2023. The population in this study were heads of families or household members in RW 05 Pallantikang Village totaling 228. The total sample was 112 family heads or members households, with a sample of 56 respondents in the intervention group in RT 02 and 56 households in the control RT.01 (the comparison between the case and control groups in this study was 1:1). Sampling was taken by total sampling that met the exclusion criteria (households that have an Android cell phone). Data collection in this study used observation sheets for application output results and puskesmas reports, to see a comparison of the number of households carrying out periodic larvae checks and a questionnaire to measure simplicity, acceptability, and timeliness after using the Si-DBD application.

## RESULTS

The distribution of the characteristics of the respondents in this study can be seen in table 1.

Based on Table 1 data, it can be seen that the respondents in this study were more or the majority were female, namely 86 people (76.79%). The proportion between the intervention and control groups for both men and women did not differ much. The distribution of respondents was seen based on age grouping, the majority of respondents were aged between 26-45 years, namely 75 people (66.96%). The distribution of respondents was seen based on the last level of education, namely the majority had completed school at the high school level, as many as 51 people (45.54%), with the proportion in the intervention and control groups only a difference of 1.9%. Judging from the employment status, the respondents in this study generally did not work or were housewives, namely 71 people (63.39%).

Based on the data in Table 2, it can be seen that in the control group, there was no significant increase in the number of households conducting periodic larvae inspections. Statistical test results show a P value of 0.669 > α 0.05 meaning that there is no significant difference before and after the manually running system. In the intervention group there was an increase in the number of housesladder 35 people who carried out periodic larva checks which had not previously been carried out and after using the application in conducting periodic larva checks. The statistical test results showed that the P value was 0.000 < α 0.05, meaning that there was a significant difference before and after using the Si-DBD application.

Based on Table 3 data, it can be seen that more households did not carry out periodic larva checks before the study in both the intervention group and the control group, with the statistical test results showing a P value of 0.534 > α 0.05 meaning that there was no significant difference between the control group and intervention before the use of the Si-DBD application on periodic larva checks. After using the Si-DBD application, more households carry out periodic larva inspections compared to the manually running system, with statistical test results showing a P value of 0.000 < α 0.05, meaning that there is a difference in the number of households conducting periodic larva inspections after using the application. Si-DBD is compared with a manually running system.

Based on the data in Table 4 it can be seen that the value pre-test the average in the intervention group was higher than the control group. Statistical test results show that all variables have a P value > α 0.05, which means there is no difference in value *pre-tests* significant in all variables between the intervention and control groups.

Based on the data in Table 5 it can be seen that the average value post-test in the intervention group was higher than the control group, with the highest difference, namely in the timeliness variable of 61.78%. Statistical test results on all variables show a P value < α 0.05, which means that there are significant differences in the simplicity, acceptability, timeliness, and quality of data on value post-test between the intervention and control groups or in other words after using the Si-DBD application the system becomes simple, acceptable and timely.

**Table 1: Frequency distribution of respondent characteristics in Pallantikang Sub-District Health Center City, Bantaeng Regency in 2023.**

Characteristics of Respondents	Intervention Group		Control Group		Total	
	n	%	n	%	n	%
<b>Gender</b>						
Man	12	21.43	14	25.00	26	23.21
Woman	44	78.57	42	75.00	86	76.79
<b>Age</b>						
12-25 Years	4	7.14	6	10.71	10	8.93
26-45 Years	49	87.50	26	46.43	75	66.96
36-55 Years	2	3.57	16	28.57	18	16.07
56-65 Years	1	1.79	7	12.50	8	7.14
>65 Years	0	0.00	1	1.79	1	0.89
<b>Education</b>						
SD	6	10.71	11	19.64	17	15.18
Junior High School	20	35.71	15	26.79	35	31.25
Senior High School	26	46.43	25	44.64	51	45.54
College	4	7.14	5	8.93	9	8.04
<b>Work</b>						
Doesn't work	34	60.71	37	66.07	71	63.39
Permanent Worker	14	25.00	13	23.21	27	24.11
Part-time worker	1	1.79	0	0.00	1	0.89
Self-employed	7	12.50	6	10.71	13	11.61

**Table 2: Differences in the number of households in periodic larvae examination before and after using the manual system (control) and the Si-DBD application system (intervention) in Pallantikang Sub-District, City Health Center Bantaeng Regency in 2023.**

Periodic Larvae Examination Group	Before	After		Total	P value
		Yes	No		
Control	Yes	5	10	15	0.669
	No	12	29	41	
	Total	17	39	56	
Intervention	Yes	17	1	18	0.000
	No	35	3	38	
	Total	52	4	56	

Source: Secondary Data 2022 and Primary 2023

**Table 3: Differences in the number of households in periodic larvae examination before and after using the manual system (Control) and the Si-DBD application system (intervention) in Pallantikang Village Health Center, Bantaeng Regency City, 2023.**

Periodic Larvae Examination	Variable	Yes	No	N	P value
Before	Control	15	41	56	0.534
	Intervention	18	38	56	
After	Control	17	39	56	0.000
	Intervention	52	4	56	

Source: Secondary Data 2022 and Primary, 2023

**Table 4: Differences in Pre-Test values on simplicity, acceptance, and timeliness between intervention and control groups in Pallantikang Sub-District Health Center Bantaeng City in 2023.**

Variable	Treatment	Means	SD	Difference		P value
				Means	SD	
Simplicity	Intervention	35	34.58	11.08	12.54	0.315
	Control	23,92	22.04			
Reception	Intervention	34,64	34,63	12.50	12.50	0.150
	Control	22,14	22,13			
Punctuality	Intervention	25,71	21.81	2,14	4.71	0.666
	Control	23.57	17,10			

Source: Primary Data, 2023

**Table 5: Differences in Post-Test values on simplicity, acceptance, and timeliness between intervention and control groups in Pallantikang Sub-District Health Center Bantaeng City in 2023.**

Variable	Treatment	Means	SD	Difference		P value
				Means	SD	
Simplicity	Intervention	63,57	30.53	37,15	7,49	0.000
	Control	26,42	22.59			
Reception	Intervention	64,64	25.58	42.86	5.30	0.000
	Control	21.78	20,28			
Punctuality	Intervention	87.85	16,91	61,78	0.33	0.000
	Control	26.07	16.58			

Source: Primary Data, 2023

## DISCUSSION

### General characteristics of respondents

The general characteristics of respondents in this study based on gender were 86 women (76.79%). This research was conducted at home using an application to check larvae, therefore the respondents who did a lot of activities at home were women who became housewives whose main activities every day were at home. Meriam Webster defines the term housewife as a woman who is responsible for all the needs of her household and spends much of her time at home.<sup>13</sup>

The age group of respondents in this study was in the age range of 26-45 years, namely 75 people (66.96%). In this study, respondents must have an Android smartphone and must be able to use it, because this research is aimed at testing applications using Android smartphones in carrying out periodic larvae inspections. In line with the results of a survey of ICT users by the Ministry of Communication and Information that the age range that uses smartphones the most in Indonesia is the 20-29 age group (75.95%) and the 30-49 age group (68.34%), as well as the location where the most smartphone usage is at home 80.90%.<sup>14</sup>

Characteristics Respondents based on education in this study were mostly at the high school graduation level, namely 51 people (45.54%). Education is a major factor in individuals increasing their knowledge, as well as the need for smartphone use, the higher a person's education the higher the need for the use of information technology. Smartphone usage survey by the Ministry of Communication and Informatics that around 79.56% of smartphone users are people with high school education levels.<sup>14</sup> This application is designed to be as simple as possible so that everyone who can use a smartphone will be able to use this application to easily conduct larvae surveys on a household scale.

The type of work most of the respondents in this study were not working or as housewives (IRT), as many as 71 people (63.39%). Respondents in the study were more women and had activities at home as housewives and this research was also carried out on a household scale. Housewives have a lot of time and are more often at home. According to the Big Indonesian Dictionary (KBBI), a housewife can be interpreted as a woman who manages the implementation of various kinds of household work (not working in an office).<sup>13</sup> Based on a survey by the Ministry of Communication and Information the number of smartphone users by housewives reached 56.56%.<sup>14</sup>

### Periodic larvae examination

The movement of one house one jumantik is manually processed by the system with the webpage application and Android smartphone. The judge explained that an application is software that is used for a specific purpose, such as processing documents or managing Windows and games.<sup>15</sup> Garini explained that a smartphone is a small electronic device that has many functions for its users so that it is considered easier for certain activities.<sup>15</sup> According to the Indonesian Ministry of Health, periodic larvae inspection activities are activities aimed at eradicating mosquito larvae by checking for the presence of larvae once a week starting from inside the house to outside around the home environment, and carried out continuously and sustainably.<sup>4</sup>

The results showed that 33 households or respondents carried out periodic larva checks before the study (29.46%) and after using the system with the Si-DBD application it increased to 69 people (61.60%). The application has provided places inside and outside the home that have the potential for mosquitoes to lay eggs, making it easier for households to check and fill in the application. In line with that, the Indonesian Ministry of Health stated that the way to invite homeowners to carry out periodic larva checks is to invite them together to examine places that have the potential to become breeding grounds for mosquito larvae, for example, water reservoirs, flower pot mats, flower vases, water dispenser reservoirs, water reservoirs, dump in the back of the fridge.<sup>5</sup>

In line with research by Raharja *et al.*, explained that changing the system that was previously run manually into a mobile-based application system for use by larva monitors received a positive and very satisfying response and gained excellent traction for users in conducting larva surveys.<sup>16</sup> The novelty of the system will provide a new experience for users so that they will have an interest in and use the application.



## Differences in the number of households on periodic larva checks before and after the intervention

Periodic larvae inspection is an activity in assessing success in eradicating mosquito nests, therefore periodic larvae inspections must be carried out every week and continuously, so that the mosquito life cycle can be broken.

Periodic larvae inspections are carried out independently by households every week using the Si-DBD application. Based on the results of the study, there were differences in the number of households that carried out periodic larvae inspections before and after the study. Before using the application 17 people did periodic larva checks, then 35 people who had not previously done periodic larva checks after using the application did periodic larva checks.

In line with that the research conducted by Ni Made *et al.*, the training of jumantik cadres in utilizing the Epicollect application for periodic larva monitoring has resulted in satisfactory results in increasing the knowledge and willingness of jumantik cadres to carry out periodic larvae inspections through the Epicollect application increasing 90%.<sup>17</sup> Other studies revealed that during the Covid-19 pandemic, periodic larvae inspections were almost not carried out, after the development of a mobile application, data collection by Jumantik increased again, reaching 90% in carrying out periodic larvae inspections.<sup>11</sup>

The Si-DBD application will make it easier for households in the process of checking and reporting the results of activities, from previously carrying out inspections and recording them manually on paper, then having to store and be responsible for the data before the jumantik coordinator visits and recaps the results of inspections by households.

## Differences in the number of households on periodic larva inspections before and after between the control and intervention groups

Periodic larvae inspection before and after the intervention and control groups in this study the result that there was no difference between the intervention and control groups for households that carried out periodic larva checks before the study using the manual system. After the use of the Si-DBD application between the intervention and control groups, there was a significant difference in the number of households that carried out periodic larvae checks.

Before the use of the Si-DBD application, both in the intervention and control groups, the average household that carried out periodic larva checks was 16 houses, while after using the application, there was an increase to 52 houses that carried out periodic larva checks independently at their respective homes. The improvement can be attributed to the updating of the system which allows households to be more comfortable doing periodic larva checks.

In line with research by Helmy and Permatasari on the use of an early monitoring application for mosquito larvae online, the system can streamline the data collection process for larva surveys, making it easier to implement.<sup>18</sup> Another study was conducted that the development of an application for eradicating mosquito nests (PSN) to increase the larvae-free rate (ABJ), influences mosquito nets eradication activities through inspection of larvae, with the Android-based PSN reminder application can increase the larvae-free rate.<sup>19</sup>

In Indonesia, the Ministry of Health is working on various programs to tackle the spread of DHF. One of the programs being promoted is community empowerment in carrying out the movement to eradicate mosquito nests through jumantik cadres. Jumantik cadres become the spearhead of mosquito vector control and carry out checks for the presence of larvae at home.<sup>20</sup> The survey and research results explain that there are problems that often arise between jumantik cadres

as larva supervisors and the community as program targets. The community did not believe that this activity was carried out every week by the cadres by inspecting their homes so the homeowners refused.<sup>21</sup> In other studies evaluating periodic larvae inspection activities, updating the implementation of activities so that they are not boring and it is necessary to hold a larva-free village competition to motivate the community to work together with jumantik officers.<sup>22</sup>

Problems related to discomfort and rejection of jumantik officers will not occur, because in this study all periodic larva inspection activities are carried out by the community or in this case household members who are responsible for their respective homes in periodic larva inspection.

## System differences in simplicity, acceptability, and timeliness before and after between the control and intervention groups

**System simplicity in application usage:** The simplicity of the system will make it easier for users of the system to carry out their activities. Based on the results of the study, the application system has a significant difference in terms of simplicity before and after using the Si-DBD application during periodic larva inspection. After using the application in the intervention group compared to the control group in the manual system, there is a significant difference in the simplicity of the periodic larva inspection system in the movement of one house and one jumantik.

Research conducted by Tendra and Denok Wulandari explains that the existence of a website-based e-jumantik information system greatly facilitates the activities carried out by larva monitors in the process of recording, recording, distributing, and final reporting of periodic larva monitoring activities.<sup>23</sup> Another study conducted by Diartono *et al.*, that simplicity in mobile web features has a positive effect on increasing application usage and indirectly on the credibility of mobile web services with a P value of 0.03.<sup>24</sup>

According to Davis (1998) that the ease of use of the system is the extent to which a person believes that he can easily use a particular system so that it does not require great effort and will be free from difficulties, this includes simplicity and no constraints in using the information system according to user needs.<sup>25</sup> Lee *et al.*, (2011) explained that simplicity is an important factor that affects the usability of a system that is created.<sup>24</sup> The results of research conducted by Akbar *et al.*, that using a mobile-based application to gather data on mosquito breeding at home can facilitate officers in the data collection process and become more efficient.<sup>11</sup>

**Acceptance of the system on application use:** Reception to a system can be seen from the number of users who use or run the system that has been made, besides that there are several other factors, namely there are no objections to the time and costs incurred as a result of using the system, providing feedback and feeling satisfied with the usability of the system. Davis (1998) defines acceptance as positive or negative feelings from someone if they have to do something that will be determined, someone who has a positive attitude in response to the use of a new information technology system, then he is said to have an interest in using that technology.<sup>25</sup>

Based on the results of the study, the application system has significant differences in terms of acceptance before and after the use of the Si-DBD application during periodic larvae inspections. After using the application in the intervention group compared to the control group, the manual system had a significant difference in acceptance of periodic larvae inspection. Research by Hermansyah *et al.*, that the use of the m-Health application for posyandu based on Android can be well received and implemented by Puskesmas officers.<sup>26</sup>

In line with this, another study conducted by Amalia explained that before using the UNY HSC application, the average patient and member satisfaction in health services was 85.83% and after using the UNY HSC application, the average satisfaction increased by 95.16%.<sup>27</sup> The assessment on the trial of the Sehati Midwife application and the Sehati Dashboard explained that all respondents stated that they did not mind after they paid a fee to access the Healthy Midwife application.<sup>28</sup> This indicates that the respondent who uses the application accepts the system with the application used. Another study was also conducted by Wulandari explaining that the use of the Health Oncodoc mobile application is in the category acceptable to users with an average value of 70.88%.<sup>29</sup>

**Timeliness of the system on application usage:** The timeliness of a system used is by looking at the time of implementation of activities and reporting of activity results by the specified flow and time. Based on the results of the study show that the application system has significant differences in terms of timeliness before and after using the Si-DBD application. After using the application in the intervention group compared to the control group in the manual system, there was a significant difference in the timeliness of the periodic larva inspection system in the movement of one house and one jumantik. According to Jogiyanto (2005), timeliness is a process that shows that information coming to the recipient should not be late, all related factors considered accordingly.<sup>30-38</sup>

In line with the research conducted by Saputri and Nurfauziah that by using an android-based larva monitoring management information system can be used to process data and report the results of monitoring larvae on time because reports can be sent directly in the digitized form.<sup>31</sup> Another study conducted by Septiana explained that the e-jumantik information system guarantees the availability of information in a computerized form so that it can be obtained quickly and on time.<sup>32</sup>

## CONCLUSION

Based on the results of the research and discussion regarding the effectiveness of the Si-DBD application on the number of households during periodic larvae examinations in the Pallantikang Sub-District, the City Health Center, Bantaeng Regency, the following conclusions can be drawn:

There is a difference in the number of households carrying out periodic larvae checks before and after using the Si-DBD application with a value of  $P = 0.000$ .

No difference in the number of households carrying out periodic larvae checks before and after the manual system is running with a value of  $P=0.669$ .

There is an effect of using the Si-DBD application on the number of households in periodic larva inspection compared to the manual system that is running, with a value of  $P = 0.000$ .

There were no significant differences in the system with simplicity, acceptability, and timeliness before using the Si-DBD application between the intervention and control groups.

There were significant differences in the system with simplicity, acceptability, and timeliness after using the Si-DBD application between the intervention and control groups.

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