Application of Dengue Hemorrhagic Fever Information System (SI-DBD) for Recording and Reporting of DHF Suspects at Kota Public Health Centers in Bantaeng Regency

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Abstract: *Background*: Dengue fever is the most common viral infection transmitted by Aedes mosquitoes. This disease puts more than 3.9 billion people from 129 countries at risk of contracting dengue fever and causes 40,000 deaths each year. This study aims to analyze the effectiveness of SI-DBD applications for finding, recording, and reporting suspected cases of dengue.

Methods: This type of research is a quasi-experiment with The Nonrandomized Control Group Pretest Posttest Design, namely there were two treatment groups (SI-DBD application users) at RT 02 and (a control group) at RT. 01, with a sample of 112 households (1:1 ratio). Data was collected through interviews and reports of suspected dengue fever.

Results: There was an increase in reporting of suspected dengue after using the Application of the Dengue Hemorrhagic Fever Information System (SI-DBD) (233.33%). Statistical test results in the intervention group's simplicity, acceptability, data quality, and timeliness had $p < 0.000$, meaning that there were significant differences in all variables studied in the reporting system using the SI-DBD application. In the control group, statistical tests showed that the acceptability variable had a $p < 0.0001$, meaning that there were significant differences in the acceptability variable in the use of the manual system before and during the study while the variables were for simplicity, data quality, and timeliness had a $p > 0.1797$, 0.0833, 0.5567 means that there is no significant difference in these variables in the manual reporting system.

Conclusion: SI-DBD application is effective for recording and reporting suspected dengue.

Keywords: Dengue Fever, DHF, System Surveillance, m-Health, Health Center.

INTRODUCTION

Dengue fever is the most common viral infection transmitted by Aedes mosquitoes. This disease puts more than 3.9 billion people from 129 countries at risk of contracting dengue fever, with an estimated 96 million symptomatic cases, and causes 40,000 deaths each year [1].

It is estimated that 1.3 billion dengue hemorrhagic fever cases in the Southeast Asian Region are in DHF endemic areas (India, Indonesia, Myanmar, Sri Lanka, and Thailand), putting these among the 30 most endemic countries for DHF in the world. From 2015 to 2019, DHF cases in the Southeast Asia region increased by 46% (451,442 cases to 658,301 cases) while the mortality due to DHF decreased by 2% (1,584 cases to 1,555 cases). The high cases of dengue fever in the Southeast Asian region are supported by the absence of effective treatment, and the lack of comprehensive sustainable vector control [2].

Epidemics of dengue fever were first reported from 1779 to 1980 in Asia, Africa and North America. The spread of the dengue virus through the Aedes aegypty mosquito through the transit sector of ships in several parts of the world [3].

The factors responsible for the expansion and spread of the DHF vector and mosquito virus in the Southeast Asian region are (i) high population growth rates; (ii) inadequate water supply and poor storage; (iii) wastewater management system; (iv) Increasing global trade and tourism; (v) global warming; (vi) changes in public health policy; (vii) development of hyper-endemicity in urban areas, etc. So the need for an effective dengue fever control program requires a

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regional approach, collaboration between countries, and sustainable partnerships [4]. The prevalence of DHF is mostly related to environmental transitions and climate change has resulted in changes in the life cycle of mosquitoes and the evolution of the dengue virus so that it is necessary to identify a wider pattern of cases on regional characteristics, bearing in mind that this disease has the potential to become an epidemic at any time [5].

Warmer temperatures can increase the transmission of dengue fever in various ways. This allows the vector to survive and reach maturity much more quickly than at lower temperatures [6].

According to data from the Ministry of Health Indonesia, the number of DHF cases as of October 2022 was 98,107 cases (IR 35.69/100,000 population) with a total death rate of 873 cases (CFR 0.89%) and the incidence of DHF in South Sulawesi in 2019 was 3,747 cases (IR 41.0/100,000 population) with 25 deaths (CFR 0.67%). The highest number of cases was in Pangkep Regency with 517 cases and 12 deaths [7]. Incidence of DHF cases in 2020 with a total of 2,714 cases (IR 29.6/100,000 population) and 27 deaths (CFR 0.99%). The highest number of DHF cases was in Gowa Regency with 457 cases, while the highest number of DHF cases was in Maros Regency with 7 cases [8].

The trend of DHF cases in Bantaeng Regency for the last 4 years has been 113 cases in 2018, 103 cases in 2019, 64 cases in 2020, and 78 cases in 2021, and no deaths from DHF (CFR 0.0%) [9]. The SI-DHF application is an application designed to be used by the public in reporting and recording suspected DHF cases which is expected to be able to handle DHF problems at the Kota Public Health Center in Bantaeng Regency.

METHODS

This research uses a type of Quasi Research The experimental design uses "The Nonrandomized Control Group Pretest Posttest Design", namely there are two treatment groups, (SI-DBD application users) and a control group, both of which were non-randomly selected.

This research was conducted at the Kota Public Health Center in Bantaeng Regency. This research was conducted on 01 February - 30 April 2023. The population in this study were households in the RW. 05, Pallantikang District with a total of 228 houses holds. The total sample in this study was 112 households, of which RT.01 was the control group (56 households) and the intervention group was RT.02 (56 households). The selection of the intervention group and the control group was based on the highest number of dengue cases in the area. The research instrument in this study was a questionnaire used to collect data from respondents. The selection of the intervention group and the control group was based on the highest number of dengue cases in the region. The research instrument in this study was a questionnaire used to collect data from the respondents.

RESULTS

The process of designing and developing the Application of Dengue Hemorrhagic Fever Information System (SI-DBD) at Kota Health Centers goes through the ongoing system analysis stages: the DHF disease

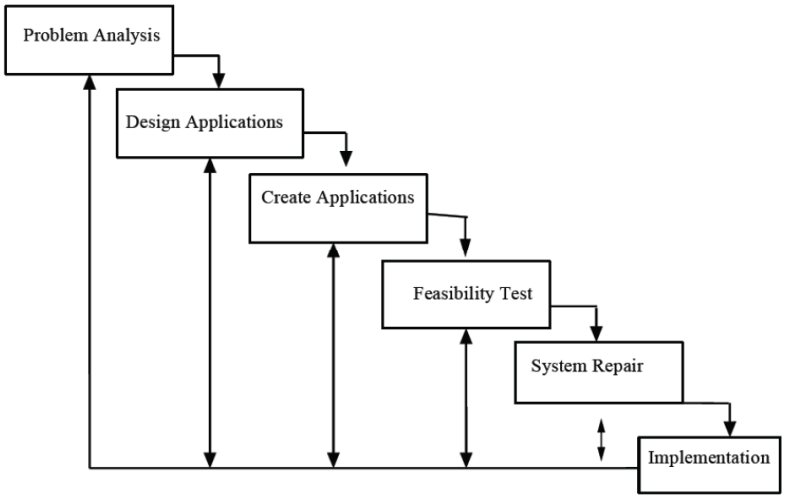

Figure 1: Design Flow System.

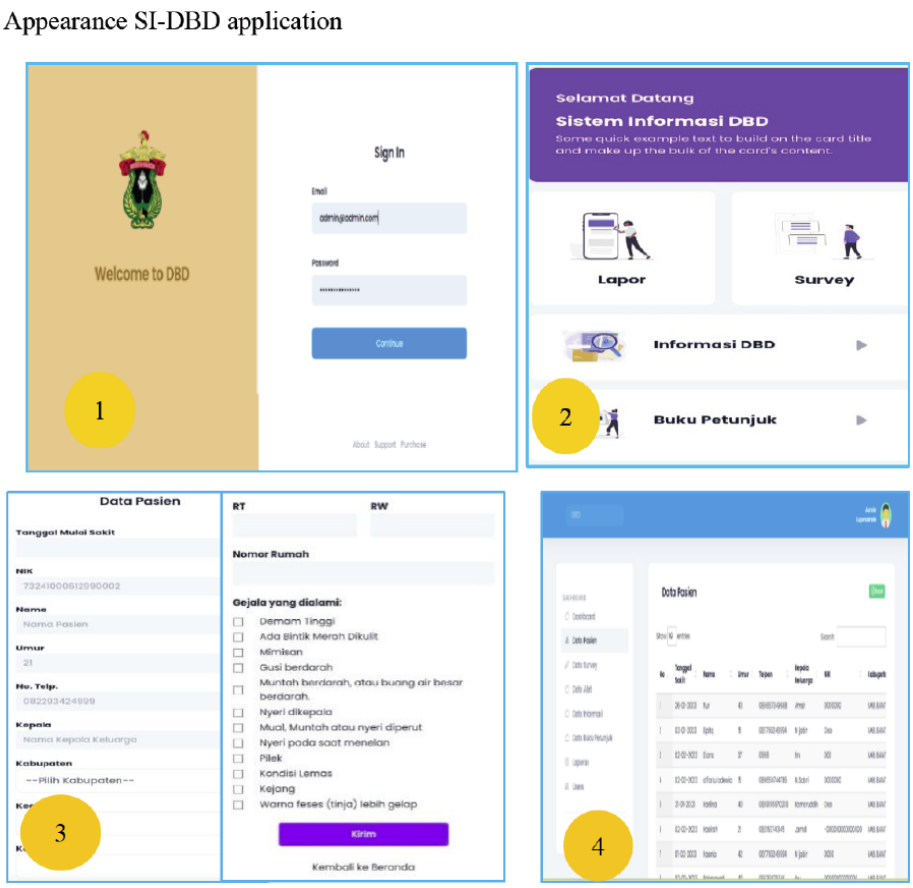

Figure 2: Appearance SI-DBD application.

surveillance system is still being carried out passively, only waiting for reports from the General Polyclinic and the Poli Emergency Unit or reports from the Hospital, the DHF surveillance system from the community has not been running causing delays in the handling of diseases in people who do not visit health care facilities so that it is necessary to have an application system that reports DHF cases based on the community, so that treatment can be carried out quickly and precisely.

The system design process is through several stages namely:

The distribution of the characteristics of the respondents can be seen in the following table:

Table **1** shows that the majority of respondents are female, namely as many as 86 people (76.79 %) with the highest proportion in the intervention group that is as many as 44 people (78.57 %). The most age group of respondents in the age group 26-45 years is as much as 75 people (66.96%). Respondents with the age group of 26-45 years were more in the intervention group as many as 49 people (87.50%) compared to the toon intervention group as many as 26 people (46.43%). The highest educational level of the last respondent was Senior High School, namely as many as 51 people (45.54%) while the least amount of respondents was with the last education level college. Respondents with a high school level of education were more common in the group as much intervention 26 persons (46.43 %) compared to the control group of 25 persons (44.64%). The majority of respondents did not work (Housewives and students), namely as many as 71 people (63.39%) while which most wlittle that is respondent with work not fixed 1 person (0.89%).

Respondents by not working more in the intervention group by 37 people (66.07%) compared to the control group of 34 people (60.71%).

Comparison of the number of dengue suspects at Kota Public Health Centers before and after the study can be seen in the following graph.

Based on Figure **3**, it can be seen that there was an increase in reporting of suspected dengue in the intervention group after using the application from 9 suspects to 30 suspects, while in the control group, there was also a decrease in reports of suspected

Table 1: Distribution Based on Respondents' Characteristics at Kota Public Health Centers in Bantaeng Regency

General Characteristics	Intervention Group		Control Group		Total	
	n	%	n	%	n	%
Gender						
Male	1 2	21.43	14	25.00	26	23.21
Female	44	78.57	42	75.00	86	76.79
Age						
12-25 years	4	7.14	6	10.71	10	8 .93
26-45 years	49	87.50	26	46.43	75	66.96
46-55 years	2	3.57	1 6	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
Education						
Elementary School	6	10.71	11	19.64	1 7	1 5.18
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
Worker						
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

Source: Primary Data, 2023.

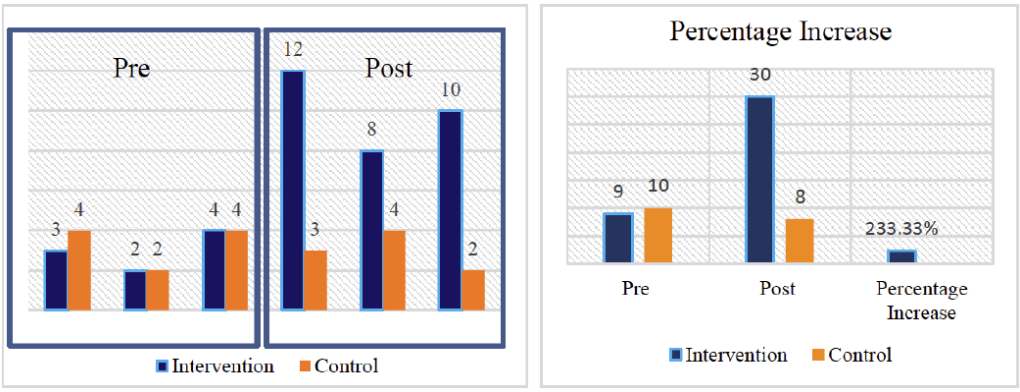

Figure 3: Differences in the Number of Dengue Suspects Before and After the Study at the Kota Public Health Center in Bantaeng Regency.

Source: Primary Data, 2023.

dengue from 10 suspects before the study to 8 suspects during the study the percentage of dengue suspects increased of 233.33%.

Based on Table **2** data it can be seen that the post-test mean on the variable of the simplicity of 46.78, acceptability of 51.07, data quality of 49.64, and timeliness of 28.92. Statistical test results show that the variables simplicity, acceptability, data quality, and timeliness have a p-value of 0.000 < 0.05, meaning that there are significant differences in the variables of simplicity, acceptability, data quality, and timeliness in the use of the dengue suspect reporting system using the SI-DBD application before and during the study in the intervention group.

Table 2: Differences in Reporting Systems before and during the Study in the Intervention Group at Kota Public Health Centers

System	Variables	Means	SD	Difference		P-Value
				Means	SD	
Simplicity	Pre	18.21	16.30	28.57	8.49	0.0000
	Post	46.78	24.79			
Acceptability	Pre	24.28	18.17	26.79	7.1	0.0000
	Post	51.07	25.27			
Data Quality	Pre	22.5	17.91	27.14	6.0	0.0000
	Post	49.64	23.19			
Timeliness	Pre	23.92	17.23	5.0	4.98	0.0000
	Post	28.92	22.21			

Source: Data Primary, 2023.

Table 3: Differences in Reporting Systems before and during Research in the Control Group at Kota Public Health Center in Bantaeng Regency

System	Variables	Means	SD	Difference		P-values
				Means	SD	
Simplicity	Pre	19.28	17.46	1.07	0.2	0.1797
	Post	20.35	17.26			
Acceptability	Pre	18.57	17.41	4.64	3.74	0.0003
	Post	23.21	21.15			
Data Quality	Pre	16.75	16.52	1.1	0.39	0.0833
	Post	17.85	16.91			
Timeliness	Pre	17.5	16.65	0.71	1.35	0.5567
	Post	18.21	18.00			

Source: Data Primary, 2023.

Based on Table **3**, data it can be seen that the - post-test mean on the variable of simplicity of 20.35, acceptability, of 23.21 data quality of 17.85, and timeliness of 18.21. The acceptability variable has a higher average difference value when compared to other variables, there is an increase in the acceptability variable of 4.64 points.

The statistical test results show that the acceptability variable has a p-value of 0.000 < 0.05, meaning that there is a significant difference in the acceptability variable in the use of the manual system before and during the study in the control group. The simplicity variable has a p-value of 0.1797 > 0.05, a data quality p-value of 0.0833 > 0.05, and the timeliness p-value of 0.5567 > 0.05, meaning that there is no significant difference in the variables of simplicity, data quality, and timeliness in the use of manual reporting systems before and during the study in the control group.

DISCUSSION

1. Differences in the number of reported dengue suspects before and during the study - in users of the SI-DBD application and manually reported cases.

Based on the results of the research conducted, it can be seen that there was an increase in reporting of suspected dengue in the intervention group after using the application from 9 suspects to 30 suspects, while in the control group, there was a decrease in reports of suspected dengue from 10 suspects before the study to 8 suspects during the study. The increase in reporting of suspected dengue after the intervention in the intervention group experienced an increase of 233.33% when compared to the control group which used manual reporting of suspects which did not experience an increase. There was a trend of increasing reporting of suspected dengue before and

after the use of the SI-DBD application at the Kota Public Health Center in Bantaeng Regency.

This data shows that the use of the SI-DBD application in a limited period is effective for the early detection of dengue cases in the community. The use of this novel system will provide a scientific give.

The increase in Covid-19 cases prompted the Indonesian Ministry of Health to make applications for tracking and monitoring the patients and close contacts of confirmed cases of Covid-19, based on the evaluation results of the Silacak Application trials conducted by the Indonesian Health Ministry in eight districts/cities in Indonesia showing that 57.10% of respondents said that using the Silacak Application was easy to use, as many as 63.10% of respondents gave a good assessment of the Silacak Application [10].

Research conducted by Raharja *et al.,* related to changing the previously used manual system to 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 [11].

The results of this study are in line with research conducted by Resmaini, R *et al.,* using an Android-based application to detect breeding places for dengue mosquito larvae in Imogiri District, Regency Bantul was able to monitor, record and track the location of the whereabouts of the Aedes aegypti mosquito larvae [12].

The Department of Community Medicine University of Indonesia has also designed an application called health point (HP Kader), where this application can identify which areas are at high risk of dengue cases so that maximum prevention efforts can be made [13].

2. Differences in the effectiveness of the dengue suspect reporting system; using the manual method and the SI-DBD application.

a. Simplicity

Based on the results of this study, the mean value increased after the post-test in the intervention group by 46.78, while the control group was only 20.35. The statistical test results showed that the simplicity variable in the intervention group had an ap value of 0.000 < 0.05, meaning that there is a significant difference in the simplicity variable of the dengue suspect reporting system using the SI-DBD application. This increase may be rendered to the ease of reporting through the SI-DBD application. Reporting using the SI-DBD application is much simpler because the reporter only sends a suspect report through the application from home and the report data will quickly reach the Public Health Center staff. Meanwhile, the results of statistical tests in the control group had a p-value of 0.1797 > 0.05, meaning that there was no significant difference in the simple variable before and during the study, reporting of suspects was done manually by the household, then reporting to the head of the RT or bringing the reporting form directly manually to the Public Health Center if someone is suspected of DHF so that the community feels that the flow of reporting like this is not simple, in fact, there is no difference when people come directly to the Health Center for treatment without having to report beforehand.

According to WHO, mobile technology provides a fast, simple, and affordable platform used in the collection, analysis, and interpretation of data during the SARS outbreak in Cambodia [14].

The results of this study are in line with those carried out by Siswanto that the database test that has been developed in the Hajj Surveillance system at the Port Health Office Surabaya provides convenience in entering, processing, and providing fast, accurate, and complete data information [15].

Other research results on the Online Registration Application Service System at RSUP Dr. Sardjito Yogyakarta by Esa Septian make service easier and faster [16]

M-health makes data collectors more efficient, reducing data collection time and costs [14].

b. Acceptability

Based on the results of the study, it can be seen that the mean value of the acceptance variable has increased after the post-test in the intervention group which was a higher increase of 51.07 compared to the control group of only 23.21. Results Statistical test showed that the acceptance variable in the intervention group had a p-value of 0.000 < 0.05, meaning that there is a significant difference in the acceptance variable of the suspected dengue reporting system using the SI-DBD application. The control group also shows that the statistical test results on the acceptability variable have a p-value of 0.0003 < 0.05

meaning there is a significant difference in the acceptability variable before and at the time of research.

Acceptability of a system can be seen from the level of community participation that implements a system that is being built, the system for reporting suspected dengue using an application or manually can be accepted by the community, this shows that the community already has high awareness of the dangers of DHF to immediately report it to the Public Health Center if anyone is suspected of dengue.

The results of the study by Esa Septian show that the level of patient acceptability in accessing services through the online registration application is satisfactory but still below the target despite experiencing a difference in the increase in online registration from 2019 [16].

Another study conducted by Lilik Zuhriyah stated that the use of a mobile DHF surveillance tool, namely the "Alert DBD" application, can be accepted by the community and health workers to assist DHF surveillance and its risk factors but needs further development to produce real-time and real place data and be user friendly [18].

c. Data Quality

Based on the research results, it can be seen that the mean value of the data quality variable has increased after the post-test in the intervention group of 49.64 while in the control group, it was only 17.85.

The test results showed the quality of the data, in the intervention group it had a value of 0.000 < 0.05, meaning that there was a significant difference in the data quality variables of the suspected dengue reporting system using the SI-DBD application. The SI-DBD application provides complete, accurate, fast, well-documented, and easily accessible data to maintain good data quality. The results of statistical tests in the control group had a value of 0.0833 > 0.05, meaning that there was no significant difference in the variable quality of the data before and during the study. Data that is reported manually to the Public Health Center has a greater risk of being lost or scattered, especially if the reporting is not well documented.

The results of a literature review conducted by Permatasari, A *et al.* show that the use of m-health can improve the accuracy, completeness, timeliness, and timeliness of data collection [17].

d. Timeliness

Based on the results of this study it can be seen that the mean value has increased by after the post-test in the intervention group of 28.92, higher than the control group of only 18.21.

The results of statistical tests showed that the timeliness variable in the intervention group had a value of 0.000 < 0.05, meaning that there was a significant difference in the timeliness variable of the dengue suspect reporting system using the SI-DBD application, data sent using the SI-DBD application is more real-time to the health center staff, so that follow-up is possible immediately. Whereas in the control group, the statistical test results on the punctuality variable had a p-value of 0.5567 > 0.05 meaning that there was no significant difference in the punctuality variable before and during the study. Reporting manually certainly takes longer because the completed reporting form will first be reported to the head of the RT, and then to the health center staff. This complicated reporting flow causes reports to be slow to reach the Public Health Center staff.

Increasingly sophisticated health information systems (enabled through mobile- and computer-based data collection, aggregation, and reporting) are expanding the capacities of real-time monitoring and prospective surveillance [14].

The results of research conducted by Putri, SA *et al.* are in line with the use of an Android-based larva recording system application with the certainty factor method that can help provide quick decision support for health workers to determine the treatment chosen following the predicted free number value [19].

Data collection using an application by Permatasari, AD *et al.* which is carried out in real-time in the field can minimize errors so that the system becomes more effective [17]. In line with this, research conducted by Ebner, PJ *et al.* also shows that the use of m-Health can produce real-time data even in areas where access is restricted by seasonally impassable roads and limited manpower [20].

The results of research by Singh *et al.* using m-Health show that it reduces the data collection time by almost 1.5 times, faster than doing it manually, thereby reducing data collection costs and the time required for data management [21].

CONCLUSION

One of the right strategies to reduce DHF cases is DHF surveillance. The DHF surveillance system at Kota Public Health Center is still carried out passively and reporting is done manually. This problem can lead to an increase in cases and deaths from DHF because patients are treated slowly. Technological developments allow active surveillance to increase the discovery, recording, and reporting of DHF cases, one of which is using the SI-DBD application.

Recording and reporting using the SI-DBD application support an active surveillance system that provides data quickly, precisely, and in real-time and because the user is the community cases of suspected dengue in the community can be detected earlier when compared to manual reporting where reporting takes longer to reach the officer's health and the risk of losing data is much greater.

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