

Web-Based Application Development of Early Detection of High-Risk Maternal Referral System in the Islands Region (SIDILAN) in South Bangka Regency

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Abstract

Every pregnancy can develop into complications at any time; therefore, pregnant women need to monitor their health during pregnancy. Maternal problems/complications can be reduced or prevented by various improvement efforts in the field of obstetric health services. Failure in handling obstetric emergency cases is generally caused by failure to recognize early risk in pregnancy. Currently, there are many efforts as early detection of pregnancy risk factors, one of them is by using the Scor Poedji Rochyati Card method as a means of detecting pregnancy risk and as a recording and reporting system for midwives. Computerization is very helpful in the process of early detection and recording of reports for midwives in health centers/regions. This research developed a web-based application of early detection of high-risk maternal referral systems in the island regions (SIDILAN) in South Bangka Regency in 2018. This study uses a study *Quasi Experiment Design* with research design of *pre-post only group design*. The results of the study using the Willcoxon test and obtained a value of $P < 0.001$. It is found that SIDILAN has higher benefits compared to manual data recording and detection.

Keywords: *Pregnancy, early detection, application*

Introduction

World Health Organization (WHO) has launched the *Sustainable Development Goals (SDGs)*, replacing the previous *Millennium Development Goals (MDGs) program*, which was completed at the end of 2015. On the target of SDGs 3.1, which is to reduce maternal mortality globally in 2030 to 70 per 100,000 live births, where this target is to continue the program from the MDGs 5a target, which is to reduce 75% of maternal mortality rate from 1990-2015¹. Maternal mortality figures are indicators that reflect maternal health status, especially the risk of death for mothers during pregnancy and childbirth².

South Bangka Regency is part of the Bangka Belitung Islands Province, consisting of eight districts and three

villages. The population of South Bangka Regency according to data from the Central Statistics Agency of the Republic of Indonesia in 2014 was 194,686 people³. The maternal mortality rate in this region was 105.26 per 100,000 live births and decreased compared to the 2013 maternal mortality rate of 107.12 per 100,000 live births. Even though the maternal mortality rate has decreased over the past four years, this figure has still not reached the Millennium Development Indicator target Goals (MGDs) in 2015 which only amounted to 102 per 100,000 live births³.

Maternal death and illness can be reduced or prevented by various efforts to improve obstetric health services. Failure in handling obstetric emergency cases is generally caused by failure to recognize the risk of pregnancy, late referral, lack of means to care for high-risk pregnant women, lack of knowledge of medical personnel, medic and sufferers in recognizing high-risk pregnancies early, problems in obstetric services and economic conditions can cause maternal

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death⁴. Therefore, early detection by health workers and the public about the presence of risk factors and complications, as well as adequate treatment as early as possible, is the key to success in reducing maternal and infant mortality rates⁵. Scorecard in a simple format is easier to fill by health workers in order to screen pregnant women and classify mothers according to the problem so that they can determine in the process of decision making and appropriate interventions for pregnant women based on the card⁶. Other factors that influence the high maternal mortality rate are the late referral process and the unpreparedness of health facilities to conduct the comprehensive emergency obstetric services⁴. Poor infrastructure, inadequate transportation services, distances, and travel times that are too far from health facilities and dangerous social practices play a significant role in maternal mortality⁷.

With a good referral system, it is expected that cases with high risk can be handled more quickly, accurately, and sustainably, which in turn can lead to reduced maternal and child mortality as a benchmark for reproductive health services⁸. The scoring system can also be correct, but there are non-medical constraints, such as the term “Three Late”: late in decision making, late in transportation, late in getting. These occurrences are still prevalent and are a significant contributor to perinatal maternal mortality morbidity⁹. The referral process that is following procedural will speed up the handling of obstetric emergency cases. If the situation gets worse and cannot be handled, the health center will follow up by referring the woman to the regional hospital due to limited facilities and is not supported by obstetricians, so often patients with obstetric emergencies are referred again to hospitals that have facilities and infrastructure for obstetric emergencies¹⁰.

Thus, the task of a midwife is the key to success in reducing maternal mortality by making proper early detection and referring patients to the referral health facility quickly and accurately. The only obstacle encountered in the preliminary observations in South Bangka Regency is geography. The distance of the village health post to the health center is far, and some are located on islands that are separated from the mainland, such as Lepar Island and Pongok Island, making it challenging to report early detection and reconciliation manually. Therefore we need accommodative technology to solve

this problem. Under these conditions, the development of the High-Risk Early Detection Application, the web-based Maternal Provisions System (SIDILAN) for midwives in the South Bangka Regency, is an innovation to overcome this gap.

Method

The design of this study is a quasi-experimental study with *pre* and *post-test one-group design* research that the conclusions are obtained by assessing respondents before and after the intervention by learning about the use of pregnancy risk detection tools and the referral system. This research conducted in the South Bangka Regency Health Office, during January-October 2019. Collaboration with IT staff related to the concept and purpose of the model, the content of the model, and the use of the model is established. Included in this step is the preparation of supporting components to prepare guidelines and manuals. Then an initial product trial is carried out. The initial product/model draft will be tested on a limited sample of midwives who provide services at the community health center in the Toboali district. Respondents will be given a high-risk early detection application (SDILAN). At the time of the trial, the researcher made observations and, afterward, interviews with respondents. At revision stage, an evaluation of the results of the field trial will be carried out from assessing any deficiencies. From the evaluation results, improvements were made to improve the existing deficiencies. Testing was conducted on 32 respondents through a questionnaire, and interviews and results were analyzed.

Results

Pregnant Women Screening Data in the South Bangka Region

Based on the screening data of pregnant women in the South Bangka region, data on pregnant women with low risk are 83 pregnant women, 62 are at high risk, and very high risks are 18 pregnant women. Pregnant women with low, high, and very high risks are found in the Simpang Rimba Health Center, each at 46.9%, 82.2%, and 44.4%.

Table 1. Screening Data for Pregnant Women in the South Bangka Region

No	Name of Community Health Centers	Risk of Pregnant women		
		Low Risk	High Risk	Very High Risk
1	Toboali	11	12	2
2	Simpang Rimba	39	51	8
3	Rias	2	4	1
4	Pongok	0	0	0
5	Air Gegas	0	0	0
6	Air Bara	4	10	2
7	Tanjung Labu	12	17	2
8	Tiram	0	0	0
9	Payung	15	29	3
10	Batu Betumpang	0	0	0
TOTAL		83	62	18

Data on Pregnant Women who have Health Insurance Participation

Based on health insurance ownership data in the SIDILAN application, data obtained from mothers who had health insurance as much as 35.8% while those without health insurance as much as 64.2%

Table 2. Data on Pregnant Women who have Health Insurance Participation in the South Bangka Region

No	Name of Community Health Centers	Health Insurance Participation	
		Yes	No
1	Toboali	10	15
2	Simpang Rimba	32	66
3	Rias	4	3
4	Pongok	0	0
5	Air Gegas	0	0
6	Air Bara	7	9
7	Tanjung Labu	11	22
8	Tiram	0	0
9	Payung	17	30
10	Batu Betumpang	0	0
TOTAL		81	145

Data on Reference Types for Pregnant Women at Risk

Based on the data of reference types for pregnant women at risk, there are 206 pregnant women with Early Referral Planning (ERP), 18 pregnant women with Timely Reference (TR). Pregnant women at risk with ERP most at health center Simpang Rimba at 43.6% and pregnant women at risk with TR at 44.4% at health center Simpang Rimba.

Table 3. Data Types of Referral to Risky Pregnant Women in South Bangka Region

No	Name of Community Health Centers	ERP	TR
1	Toboali	23	2
2	Simpang Rimba	90	8
3	Rias	6	1
4	Pongok	0	0
5	Air Gegas	0	0
6	Air Bara	14	2
7	Tanjung Labu	29	2
8	Tiram	0	0
9	Payung	44	3
10	Batu Betumpang	0	0
TOTAL		206	18

Analysis Usability based on the questionnaire

The pre-test and post-test data were conducted on the same 32 respondents. A pre-test to measure the use of manual recording and reporting used at the health center while the post-test data to measure the use of recording and reporting applications. Data are presented as mean \pm SEM. Furthermore, the data distribution testing was performed with *Shapiro-Wilk* using SPSS 24.0. Both pre-test and post-test data were not normally distributed ($p < 0.05$).

Table 4. Recap of the value of Usability Application-based Reporting Recording (Post-Test)

No	Question	Value percentage	Information
1	Manual recording and reporting (MRR) helps effectively record and reporting activities	78,1 %	S
2	MRR helps midwives become more productive	78,1 %	S
3	MRR is very useful	65,6 %	S
4	MRR can make midwives more in control	71,9 %	S
5	MRR can make the midwife's things to do easier	75%	S
6	MRR can save time in recording and reporting	68,8 %	S
7	MRR according to recording and reporting needs	68,8 %	S
8	MRR is in line with the midwife's expectations	75%	S
9	MRR are easy to use	71,9 %	S

Cont... Table 4. Recap of the value of Usability Application-based Reporting Recording (Post-Test)

10	Simple MRR is used	81,3 %	S
11	User-friendly MRR	71,9 %	S
12	MRR only requires very few steps to complete recording and reporting	71,9%	S
13	MRR are easily adjusted	71,9%	S
14	MRR can be done without difficulty	75%	S
15	MRR can be used without written usage instructions	68,8 %	S
16	MRR, both fixed and occasional, will like this manual recording and reporting	75%	S
17	Midwives can fix errors quickly and easily	78,1%	S
18	Midwife successfully uses the application whenever opening it	75%	S
19	Midwives can quickly learn to use the application	75%	S
20	Midwives can easily remember how to use the application	75 %	S
21	The application is easy to learn how to use	71,9 %	S
22	Midwives are quickly involved in using the recording and reporting application	71,9%	S
23	Midwife satisfied with the application	68,8%	S
24	Midwives will recommend applications to their peers	68,8%	S
25	Interesting application to use	68,8%	S
26	The application works following what the midwife wants as a recording and reporting application	71,9%	S
27	This application is good	71,9%	S
28	Midwives feel the need for this recording and reporting application	71,9%	S
29	Midwives feel the need for this recording and reporting application	71,9%	S
30	Fun application when used	65,6%	S

Bivariate Research Results Application and Manual

The application utilization and manual recording can also be divided based on four criteria, namely usability, ease of use, ease of study and satisfaction. The difference between the four criteria in each of them is manual, and the application can be seen in Fig. 1.

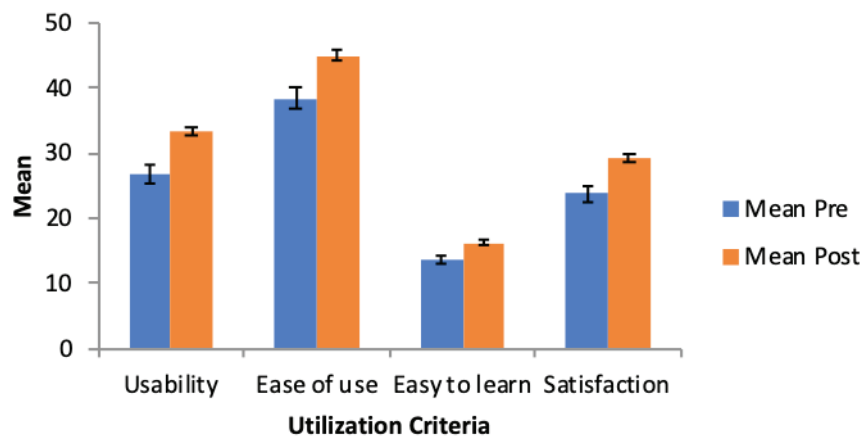


Figure 1. Analysis of the difference criteria for utilization of recording manual reporting compared to application.

Discussion

Data on Pregnant Women in South Bangka Regency

Based on the map of the distribution of high-risk pregnant women screening in the South Bangka Regency and Table 1, it can be seen that all pregnant women in the area in South Bangka Regency have been cleared using the application. Although there are still several of the community health centers that are still not maximally screening pregnant women, this is due to the difficulty of internet signals in several puskesmas in South Bangka. It is in line with research conducted by the *National Research Council (US) Committee*¹³, which states that many health recording and reporting processes are highly dependent on the internet network.

Data on Screening of Pregnant Women in the South Bangka Region

Based on Table 3, it can be seen that all pregnant women have been screened by Puskesmas midwives, which can be seen grouping pregnant women according to the Risk category. For low risk, there are 83 pregnant women, 62 high-risk pregnant women, and a very high risk of 18 pregnant women. It is in line with Poedji Rochyati's theory of a risk approach or Risk Approach Surgery strategy.

Some of these risk factors can be identified and measured so that we can use them in efforts to preventive health services⁹. So, the so-called risk approach strategy starts with the discovery of these indicators, then uses

them as a guide for further action. This understanding means that no one is free from risk. The hypothesis of a risk approach strategy is the more accurate the risk calculation is, the easier it is to understand the needs needed and the better (effective) the results⁹. Using risk factors or "scores" will make it easier for health workers to reduce delays in terms of early detection and referral.

Membership in Health Insurance

Based on data available in the SIDILAN application, 64.2% of pregnant women have not registered in health insurance membership (BPJS). It indicates the need for advocacy to people to have BPJS immediately, since it is very much needed in the referral process. One of the factors that cause mothers do not want to be referred to because it costs.

Types of Referrals

Based on data Table 3, types of referrals to pregnant women divided into two groups, namely ERP and TR. The SIDILAN application can support effective referral activities. While TR is done in GDO cases (obstetric emergency services) and requires a services emergency⁹. Based on univariate results, it is obtained that the data on the residence of pregnant women are more in the mainland. The application SIDILAN has included the distance and travel time required by the patient. It is expected that the mapping of mileage and time of travel will minimize the occurrence of delays in the referral process. The better the geographical conditions, the easier it will be to access referrals. Several studies have

used a distance of 5 km to determine whether pregnant women in rural areas are easier to get to health facilities than if the mother is within a distance of more than five kilometers¹⁴.

Bivariate Research Results of Application and Manual Utilization

The system (SIDILAN) shows an increase in utilization compared to the records carried out manually and considered more comfortable to use and applied in general, and this application can quickly detect pregnant women at risk who need to get immediate referrals to facilitate health workers/midwives, in particular, to prevent maternal and neonatal emergencies in their work area. Test results conducted in general show a significant difference between early detection of high risk, manual reference systems in the islands (103) with $p < 0.001$ ($p < 0.05$). Consecutively, the mean usability of the application is higher than the manual.

Conclusion

The research results conclude that the results of the design of high-risk early detection applications, the application-based archipelago maternal referral system (SIDILAN) has higher benefits compared to the manual-based ones.

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