Fidelity of Measles Intervention Implementation on Measles Elimination Phase in Primary Health Center City of Yogyakarta

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Abstract: **Introduction:** Measles is an infectious viral diseases that can be prevented by vaccination. Indonesia has recently entered the elimination phase, and has set the target to achieve the goal in 2020. Yogyakarta has implemented Case Based Measles Surveillance (CBMS) since 1998. Fidelity of the program may contribute to the outcome of these efforts regarding this issue. **Methods:** This research used a mixed method exploratory sequential design conducted at 18 Primary Health Centres (PHCs) City of Yogyakarta from September to November 2017. Qualitative approach by a cross sectional survey among 33 respondents. We used secondary data to support the qualitative findings. **Results:** Health staff routinely adhered to the standard operating procedures but experienced a lack of funding support for follow up and did not have adequate staff for data analysis. Surveillance and immunization officers were not always making proper coordination during the outbreak. Most of epidemiologic investigations were performed after the peak of the cases. Quality of delivery of the CBMS program lacked in: timely delivery of measles report cases, coordination with private practice in case detection, and feedback to patients about laboratory result. Quality of delivery of the measles immunization program lacked in: timely delivery report, refreshing knowledge from District Health Office (DHO) annually, and coverage of booster measles immunization , Surveillance officer's knowledge showed 46,7% was good and for immunization officer's knowledge showed only 5,6% was good. There were a number of key aspects needing improvement. **Conclusion:** Coordination between surveillance and immunization officers during outbreaks and performance of management duties are needed to address the complexity of measles intervention program implementation.

1 INTRODUCTION

Measles is an infection disease caused by the *Paramyxoviridae* family which belongs to the morbillivirus genus and can be prevented by vaccination. Routine measles immunization accompanied by mass immunization programs can be implemented in countries with low coverage of measles immunization, which are expected to help reduce global mortality from measles[1]. Measles vaccine provides long-term immunity against the measles virus[2]. After following the supplementary immunization activities (SIAs) in 2008, 192 of 193 countries delivered an offer of 2 doses of measles vaccine to make high immunity in at risk populations to prevent the measles outbreak[3]. In 2015 global control milestones and regional measles elimination goals were not achieved and more effort is needed to reach measles elimination by 2020[3]. The Indonesia Ministry of Health in the Basic Health Research (*Riskesdas)* in 2007 reported that measles was the most common cause of death in children aged 29 days-4 years in Indonesia[4]. Success was seen in the measles reduction efforts in 2015, and now Indonesia is in the measles elimination phase, and committed to the goals of ASEAN and SEARO that would achieve the elimination target by 2020[3]. In addition, the coverage of measles immunization should be at least 95% equally in all districts/cities according to World Health Organization (WHO) recommendations[6].

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Surveillance systems play an important in assessing the effectiveness of the current measles control strategies[5]. Yogyakarta has implemented the Case Based Measles Surveillance (CBMS) since 2008 and coverage of measles immunization was high in Yogyakarta City based on the Indonesia health profile of the Ministry of Health in 2014 and 2015 showing measles immunization coverage had reached 96.93% and 98.1%[7, 8], but in 2016 measles was still in the top ten of the most common diseases in Yogyakarta City[9]. The District Health Office (DHO) of Yogyakarta City reported during the year of 2016, there were 2,196 cases of suspected measles and positive measles were found in 583 cases, of which 121 cases of measles were reported from Yogyakarta City[10]. There were 2 cases of measles outbreak that occurred in 2014, and there have been 7 cases of measles outbreak from January to April 2017 [10, 11].

Due to the increasing number of measles outbreaks in the city of Yogyakarta, the researcher was interested to examine the implementation of measles program interventions in the city of Yogyakarta. In this study, researchers aimed to assess the fidelity of both the detection of and response to measles cases which occurred in Yogyakarta city in order to achieve the target of measles elimination in 2020.

2 METHODS

We conducted a mixed method study with an exploratory sequential design delivered throughout 18 Public Health Centers (PHC) in the City of Yogyakarta from September to November 2017. This study started with the collection and analysis of qualitative data to measure health staff adherence towards case-based CBMS and measles immunization SOP/guidelines, in order to to see the coordination between surveillance and the immunization officers. This initial stage was followed by the subsequent data collection and analysis of quantitative data to measure the coverage, delivery quality of CBMS-measles immunization program, and health staff knowledge. We conducted informed consent to all of respondents before data collection.

2.1 Samples

The qualitative method used purposeful sampling, specifically criterion sampling, and for quantitative method we used total population. We asked the respondents who were the Disease Surveillance Officers (DSO) to choose the PHC where we could conduct our in-depth interviews. When the DSO chose 3 PHC with measles outbreak and 3 PHC without outbreaks in that year, we asked the respondents whether they would be willing to participate in an in-depth interview. From 12 respondents consisting of 6 surveillance officers and 6 immunization programmers, all of the respondents fulfilled our inclusion criteria. The interviews started from the PHCs which had outbreak, then continued to the PHCs which had no outbreak. The total of sample subjects in the beginning of the quantitative study was 36 health staff, but 3 respondents (surveillance officers) were excluded in our study because they fulfilled our exclusion criteria. The inclusion criteria were: had been working in PHC at least 2 years; and knowledgeable in program for CBMS service delivery and measles immunization program. The exclusion criteria were: surveillance staff and immunization programmers who held the program position less than twelve (12) months; and refused to participate in data collection activities. We distributed 33 questionnaires among the selected health staff consisting of 15 surveillance officers and 18 immunization programmers.

2.2 Measures

2.2.1 Adherence of Health Staff

The researchers conducted in depth interviews among the selected respondents. We had standardized and developed an interview guide beforehand. The interviews for each respondent took about 30 minutes to one hour, we recorded the interview with electronic device and make the foot note. Then The researchers encouraged the participants to talk in-depth, prompting more details whenever possible without leading the participants to specific answers. We did the transcript from audio recorder to conducted data analysis. The analysis used descriptive content analysis.

2.2.2 Quality of Delivery

Our questionnaire consisted of respondents' demographic data; assessment of quality delivery on each program with ordinal scale of measurement; and level of knowledge of each officer with an ordinal measurement scale.

Scoring assessment on quality of delivery used a Likert scale where: (1) = never; (2) = sometimes; (3) = often; and (4) = always. We computed each category of quality of delivery score as a percentage.

The scores on the health staff's knowledge were calculated as a percentage of the total answers which were correctly answered. The level of knowledge of the health staff was calculated as a percentage.

2.2.3 Coverage

Assessment of coverage in each program used secondary data obtained from the district health office of Yogyakarta city. We obtained the number of samples examined by Ig M in cases of suspected measles; and first and second dose measles immunization coverage in 3 consecutive years (2014-2016), in a numerical measurement scale with score number per year (percentage).

2.2.4 Data Analysis

We described the results of the data obtained. In-depth interview results were analyzed by content analysis which illustrated the adherence of health staff to SOP/guidelines, where adherence was assessed starting from the routine service that had been implemented and when the measles outbreak occurred in each program. Quality of delivery and coverage analysis were conducted with statistical computation, with each category shown as a percentage result.

3 RESULT

3.1 Demographic Characteristics of Participants

The demographic characteristics of respondents in PHC of Yogyakarta City are seen in Table 1.

Table 1: Characteristic of Respondents.

No	Variables		(n=33)	%	Mean	Median	St. Deviation	Min	Max
1	Sex	Male	3	9.09					
		Female	30	90.91					
2	Qualification	Midwife	18	54.55					
		Nurse	15	45.45					
3	Department	Epid Staff	15	45.45					
		Mother & child	18	54.55					
4	Age				40.42	38	8.686	28	56
5	Length of work				15.42	14	8.846	2	31
6	Length of hold the program				7.24	5	5.309	1	27

3.2 Adherence of Health Staff Towards SOP/Guideline

Adherence of surveillance and immunization officers at PHC of Yogyakarta City has been in accordance with SOP/guidelines on routine service and during measles outbreak. However, the management of

outbreaks was not yet compatible with SOPs since not all surveillance officers coordinated with immunization programmers during field investigations; investigation of risk factors during the outbreak occurrence was still lacking; evaluation of measles immunization coverage in the last 3 years had not been done; vitamin A was only focused on the patients who suffers from measles, whereas in susceptible populations (especially toddlers) who were around the patients had not been given; and vulnerable populations within the outbreak area were not reported.

3.3 Quality of Delivery of CBMS and Immunization Program

In measurement of the quality of delivery of CBMS at primary health centers of Yogyakarta City, we found delivery of measles report cases was on time with only 26.7% who answered always, feedback to patients about laboratory result was medium with 60% who answered always, and cooperation with private practice for case finding was low with only 20% who answered always. The results are shown in Table 2.

Table 2: Quality of Delivery CBMS Program.

No	Question	Never	Sometimes	Often	Always
			n= 15		
		%	%	%	%
1	Implementation according to SOP	0	0	33.3	66.7
2	Refreshing the knowledge annually	0	13.3	26.7	60
3	Supporting facilities is available	0	0	20	80
4	There are changes to the CBMS program	40	33.3	20	6.7
5	Flexibility of program implementation related to change	53.3	13.3	13.3	20
6	Form C1 is filled completely	0	20	20	60
7	Validate data with SIMPUS	0	6.7	6.7	86.7
8	Feedback to patients about laboratory result	0	0	40	60
9	Feedback through mini workshop at PHC	6.7	20	26.7	46.7
10	Delivery of C1 reports on time	0	33.3	33.3	26.7
11	Feedback from DHO	0	0	0	100
12	Supervision from DHO	0	33.3	13.3	53.3
13	Coordination with immunization officers when measles outbreak	6.7	13.3	6.7	73.3
14	Cooperation with private practice for case finding	26.7	40	13.3	20
15	CBMS detects cases of measles and outbreaks	0	6.7	13.3	80
16	CBMS analyses the incidence of measles from year to year	0	0	26.7	73.3

In measurement of the quality of delivery measles immunization at the PHC of Yogyakarta City, we found the report delivery on time was only 27.8% who answered always, knowledge refreshed annually was 50% who answered always, and booster measles immunization coverage met the target was only 5.6% who answered always. The results are shown in the Table 3.

Primary quantitative data was also supported by secondary quantitative data from measles outbreak reports which have been made by the district health office of Yogyakarta City. The measles outbreak reported, in 2017 from January to September there

were 7 cases with 4 cases of measles outbreak, 1 case of clinical measles outbreak, and 2 cases of rubella-measles outbreaks. To see the quality of the surveillance system we also measured the response time of intervention when the outbreak was happening as seen in the Figure 1.

The curve diagram above explains the horizontal axis showing the case of measles outbreak, and vertical axis showing the week. The response time taken when giving intervention to the outbreak occurred before, during peak of case or after the case but most of the intervention came after the peak of the case. This finding suggests that the response to intervention is still lacking, although the DHO and PHC already delivered rapid response in 24 hours since the outbreak was confirmed. This finding was used to support the result of the assessment of the delivery quality of the CBMS program.

Table 3: Quality of Delivery Immunization Program.

No	Question	Never	Sometimes	Often	Always
			n = 18		
		%	%	%	%
1	The implementation according to SOP	0	0	11.1	88.9
2	knowledge refresh annually	0	22.2	27.8	50
3	Supporting facilities is available	0	0	11.1	88.9
4	There are any changes related to the measles immunization implementation	5.6	77.8	16.7	0
5	flexibility of implementation related the changes	22.2	66.7	5.6	5.6
6	report is filled completely	0	0	33.3	67.3
7	coordination with surveillance when measles outbreaks	5.6	11.1	5.6	77.8
8	campaign/socialization of measles immunization	0	16.7	16.7	66.7
9	feedback through mini workshop in PHC	0	22.2	38.9	38.9
10	feedback from DHO	0	11.1	22.2	66.7
11	supervision from DHO	0	16.7	44.4	38.9
12	report delivery on time	0	27.8	44.4	27.8
13	measles vaccine access easily	0	0	11.1	88.9
14	cooperation with private practice	11.1	16.7	5.6	66.7
15	routine measles immunization coverage meets the target	0	5.6	0	94.4
16	coverage of measles immunization of booster meet the target	27.8	55.6	11.1	5.6

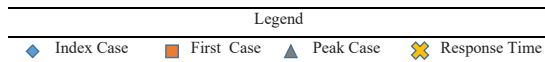| Legend			
◆ Index Case	■ First Case	▲ Peak Case	✖ Response Time

Figure 1: Response Time in 7th Cases of Measles Outbreak.

3.4 Coverage of CBMS and Measles Immunization

For CBMS program coverage we only collected sample data with measles suspects examined for Ig M in 2015-2016 as shown in Table 4.

The unclear results were obtained from patients who were sent directly from PHC to the health laboratory center (HLC) but the patients data were not in the HLC or it could be the patients did not reach the HLC to provide specimen. For immunization program data we collected first and booster measles immunization coverage from 2014-2016 as seen in Figure 2. As it is shown in the Background section that Yogyakarta has set coverage targets as WHO

recommendation, for first and second routine dose of measles vaccine should be at least 95%.

Table 4: Number Cases of Measles Suspects at PHC of Yogyakarta City 2015-2016.

Year	Total of suspect case	sample			Result			
		Taken (n)	(%)	Domicile from City	Measles (+)	Rubella (+)	Negative	Unclear
2015	604	526	87	424	58	174	292	0
2016	670	626	93	487	207	77	289	41

3.5 Knowledge of Health Staff

In the last category we measured the health staff knowledge related to CBMS for surveillance officers and measles vaccination with correlation to measles elimination goal. We categorized the result of knowledge into three levels: good if score or value reached 76-100%; moderate when the score or value reached 56-75%; and low when score or value reached <56%[12]. The level of knowledge of surveillance officers related to CBMS program showed good knowledge as many as 7 people (46.7%), moderate knowledge as many as 8 people (53.3%), and low knowledge as much 0 people (0%). The immunization staff knowledge about measles immunization program related to measles elimination program showed good knowledge as much as 1 person (5.6%), moderate knowledge as much as 6 people (33.3%), and low knowledge as much as 11 people (61.1%).

4 DISCUSSION

WHO recommendations to countries with elimination phase goals include: case-based measles surveillance should be conducted and every case should be reported and investigated immediately, also laboratory specimens should be collected from every sporadic suspected case[3]. Effective measles and rubella surveillance systems are capable of providing essential information to plan, implement and evaluate measles immunization strategies and monitor progress toward measles elimination[2]. In our study, we found that the surveillance system in Yogyakarta city could not do that, because the officers have not been able to perform data analysis for the purposes of making policy by the chairman of PHCs, and the data collected in epidemiological investigations in case of measles outbreaks did not include coverage of measles immunization in the last 3 years. In addition to having an adequate surveillance system,

maintaining high immunization coverage is an important step in controlling cases of measles[3]. It means that CBMS and measles immunization should work together to reach the elimination target. In our study we found the coverage of first-dose immunization measured in three years was 95%, which exceeds the UCI target, but the average of measles booster coverage in the last three years was 60%, which is inadequate. Another research showed that although the coverage of single-dose measles immunization was high enough, still it was not sufficient to give population protection to prevent the outbreak of measles[2]. This epidemiologic description is similar to the situation in Yogyakarta, where the first dose immunization coverage surpassed target coverage and was exceptionally high, but measurable incidents were still prevalent in the region.

Quality health services should reflect 6 dimensions based on WHO guidelines, which include effective, efficient, accessible, acceptable, equitable, and safe services[13]. In this study we found the main dimensions of effective, efficient and accessible services were present in the study sites. The quality delivery of CBMS was still inadequate in response time when the outbreak was happening, while the timeliness of monthly report delivered, and cooperation with private practice such as doctors or midwives to find the cases were also lacking. While the quality of measles immunization program services was inadequate or ineffective in timeliness of monthly report delivered, refresh knowledge from DHO annually, and coverage of immunization of measles booster were also lacking. In order to improve the overall quality of health services, all aspects should be considered holistically covering the organization, team, and health staff individually[13]. They already have a good fidelity by adhere the SOPs in routine and outbreak cases, but they still need to improve the performance of response time to have good quality delivery of CBMS.

The key for the success of surveillance systems involves not only being integrated with measles immunization programs[2], but also it should be integrated with training human resources, improving the data analysis, monitoring the impact of intervention, informing health policy design, planning and program management, and strengthening laboratory capacity, with emphasis on community participation in detection and appropriate response to public health problems[14].

5 CONCLUSIONS

Case based measles surveillance was implemented to detect, prevent and control the measles disease. District health offices of Yogyakarta already have made an alert to detect the outbreak, and conducted rapid response to give an intervention. However, a number of gaps still remain. These include inadequate human resources to perform data analysis, and a lack of coordination to meet the challenges. Although the coverage of first dose immunization can be seen as high but the second dose immunization did not meet the target and there were still many outbreaks in Yogyakarta. To properly respond to the outbreaks, the level of knowledge of immunization officers associated with the measles elimination program should be enhanced, as well as synchronization of programs between CBMS and measles immunization, so that the goal of elimination of measles in 2020 can be achieved.

One of the limitations of this study, is that the assessment is only seen from the perspective of health workers. The results would be strengthened if this research included observations and the points of view of the patients.

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