Early warning alert and response system (EWARS) in Indonesia: Highlight from the first years of implementation, 2009-2011

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Abstrak

Latar Belakang: *Sistem kewaspadaan dini dan respons KLB (EWARS) adalah sistem surveilans sindrom berbasis web, yang diberlakukan di Indonesia sejak 2009, dimulai di dua provinsi. Untuk memberikan respons yang cepat terhadap sinyal yang terdeteksi pada EWARS, algoritma untuk diagnosis dan respons serta alat pemetaan kapasitas laboratorium dikembangkan. Penelitian ini bertujuan untuk menggambarkan kinerja penerapan EWARS dan untuk mengidentifikasi kekuatan dan kesenjangan EWARS sebagai sistem kewaspadaan dini dan respons KLB.*

Metode: *Kinerja EWARS digambarkan dengan analisis data EWARS 2009-2011 di enam provinsi. Kekuatan dan kesenjangan EWARS diidentifikasi dengan melakukan penilaian umum di tiga provinsi terpilih dan penilaian kapasitas laboratorium di sembilan provinsi.*

Hasil: *Kinerja EWARS cukup baik di Bali dan Lampung pada tahun pertama pelaksanaannya. Pada tahun 2010 dan 2011, kinerja EWARS di enam provinsi tetap baik. Sistem ini mudah digunakan dan bisa memberi informasi tentang peringatan dan pemetaan mingguan. Monitoring peringatan dengan menggunakan EWARS dapat digunakan sebagai alat evaluasi untuk melihat kualitas respon yang dilakukan oleh petugas kesehatan setempat atau Rapid Response Team (RRT). Meskipun konfirmasi laboratorium belum dilakukan untuk sebagian besar peringatan yang terdeteksi oleh sistem, pada umumnya, EWARS diterima dengan baik di Lampung, Bali, dan Kalimantan Selatan, dan memberi manfaat untuk meningkatkan kinerja pada fungsi peringatan dini.*

Kesimpulan: *EWARS adalah kesempatan untuk memperkuat sistem surveilans yang berkelanjutan dan sensitif. Sistem ini diterima dengan baik karena mudah digunakan dan meningkatkan kinerja peringatan dini walapun masih perlu penguatan laboratorium.* **(Health Science Journal of Indonesia 2017;8(2):81-7)**

Kata kunci: *Sistem Kewaspadaan Dini, Respons, Pemetaan, Surveilans berbasis Web*

Abstract

Background: Early Warning Alert Response System (EWARS) is a web-based syndrome surveillance system, established in Indonesia since 2009, started in two provinces. In order to provide a prompt response of the signals detected on EWARS, the algorithms for diagnosis and response and the laboratory capacity mapping tool were developed. This study aims to describe performance of EWARS implementation and to identify the strengths and gaps of EWARS as a disease early warning and detection system.

Methods: EWARS performance was described by analysis of the EWARS data 2009-2011 in six provinces. EWARS strengths and gaps were identified by conducting general assessment in three selected provinces and laboratory capacity assessment in nine provinces.

Results: The performance of EWARS was quite good in Bali and Lampung at the first year of implementation. In 2010 and 2011, EWARS performance in six provinces was remain good. The system is easy to use and could give information on weekly alerts and mapping. Alert monitoring by using EWARS could be used as an evaluation tool to see the quality of response conducted by local health officers or Rapid Response Team (RRT). Although laboratory confirmation have not done for most of alerts detected by the system, in general, EWARS was well accepted in Lampung, Bali, and South Kalimantan, and gave beneficial to increase performance on early warning function.

Conclusion: EWARS is an opportunity to strengthen sustainable and sensitive surveillance system. The system is well accepted because of easy to use and increase the early warning performances. **(Health Science Journal of Indonesia 2017;8(2):81-7)**

Keywords: Early Warning System, Respons, Mapping, Web Surveillance

International Health Regulations (2005) or IHR (2005) is a legally binding international instrument developed through negotiation between States. The implementation of IHR (2005) has encouraged countries to develop, strengthen, and maintain their capacities to detect, verify, assess, report, and response to any events that may constitute to public health risk and prevent international spread.[1] Concerning that the best way to prevent international spread of events is to detect public health events early and implement effective response actions when the problem is small, Indonesia has committed to implement all IHR (2005)'s core capacities requirement.

As a country with diverse topography and high population movements as well as urbanization, Indonesia is facing potential threats to public health in the form of new emerging and re-emerging diseases such as malaria, dengue, diarrhea, cholera, diphtheria, anthrax, rabies, measles, pertussis, and avian influenza in humans.[2] Indonesia has to establish and maintain an effective national early warning system to detect threats. In general, early warning is a function of a surveillance system aiming to detect any abnormal phenomenon that will trigger prompt public health interventions. With regard to have minimum core capacities on early warning and detection required by IHR (2005), Ministry of Health has developed early warning system for rapid detection and response using application system, called Early Warning Alert and Response System (EWARS) in 2009.[3,4]

EWARS is a web-based syndromic surveillance system, aims to early detect health events of significance for public health and health security. There are 23 types of disease/syndrome of outbreak potential diseases reported from *Puskesmas* (Primary health care/PHC) every week (Table 1), sent via SMS to EWARS server at national level. When there is an unusual pattern of disease/syndrome, the system will provide a signal or alert to surveillance program manager at district, provincial and central level. With the emergence of these signals, the District/Municipality/Provincial Health Officer will perform the appropriate verification and response as required, including laboratory testing for diagnosis confirmation.

The Government was planning to expand EWARS to other provinces. It was important to assess of the system before expanding, to identify the strengths and gaps, including laboratory capacity to support the system. This study aims to describe performance of EWARS implementation and to identify the strengths and gaps of EWARS as a disease early warning and detection system, based on the analysis of the EWARS data 2009-2011, general assessment, and laboratory capacity assessment.

METHODS

The data analysis was conducted by using the EWARS data 2009 (Bali and Lampung) and 2010-2011 (Lampung, Bali, South Sulawesi, North Sulawesi, South Kalimantan, and West Kalimantan). The general assessment of EWARS was conducted on March 2012 in selected provinces which has the highest performance (Lampung), on average (Bali), and the lowest (South Kalimantan) based on the data gathered during 2011.

The laboratory capacity assessment was conducted in 2012 in 9 provinces by using the laboratory capacity mapping tool.[5,6] The tool covered general information on laboratory infrastructures, equipment, primers and reagents, a set of questionnaires to identify the gaps, human resource capacity, and laboratory management as well. Nine provincial health officers from 9 provinces have been trained to fulfil this laboratory capacity mapping tool and sent feedback.

RESULTS

EWARS was established in Lampung, Bali, and South Sulawesi Province in 2009. In 2010, EWARS was replicated to North Sulawesi, South Kalimantan, and West Kalimantan Province and in 2011 EWARS was introduced to D.I. Yogyakarta, Central Java, Nusa Tenggara Barat, and Central Sulawesi.[3]

In order to provide a prompt response of the signals detected on EWARS, the algorithms for diagnosis and response were developed for all syndromes in 2012. The algorithms were developed as guidance for the Rapid Response Team (RRT) on how to conduct prompt response when there is an alert/signal of event detected, including information related to laboratory confirmation such as specimen collecting, handling, shipping, and testing. The laboratory capacity mapping tool was developed as guidance on assessment of the laboratory capacity to support EWARS.

In the first year, EWARS was implemented in two provinces i.e. Bali and Lampung. Started in the midyear of 2009, the performance was quite good in Bali, with the timeliness and completeness increased from EW 30 to 52, while in Lampung there were a decrease in both timeliness and completeness (Figure 1).

During EW 27-52, there were 2452 alerts recorded in the system, come from 257 *Puskesmas* in Lampung. While in Bali, there were 1329 alerts from 115 *Puskesmas*, recorded during EW 30-52 (Figure 2). There were no data available in the system on the proportion of neither responded alerts nor the

Table 1. Priority diseases list for EWARS:[5]

No	Diseases/Syndromes	No	Diseases/Syndromes
1	Acute diarrhea	13	Acute Flaccid Paralysis (AFP)
2	Confirmed malaria	14	Cases of dog bite potential of transmitting rabies (GHPR)
3	Suspected case of Dengue fever	15	Suspect Case of Anthrax
4	Pneumonia	16	Suspect Case of Leptospira
5	Bloody diarrhea	17	Suspect case of Cholera
6	Suspect Typhoid fever	18	Cluster of Unknown disease
7	Acute jaundice syndrome	19	Meningitis / Encephalitis suspect /Encephalitis (Acute Encephalitis Syndrome)
8	Suspected case of Chikungunya	20	Suspect case of Neonatal tetanus
9	Suspected human case of Avian Influenza	21	Suspect Case of Tetanus
10	Suspect case of Measles	22	ILI (Influenza Like Illness)
11	Suspect Case of Diphtheria	23	Suspect Case of Hand Foot and Mouth Disease (HFMD)
12	Suspect Case of Pertussis		

Table 2: Laboratory Capacity Mapping of 5 Provinces

No	Province	Bali (n-6)	NTB (n=3)	Lampung (n=2)	South Sulawesi (n=4)	Banten (n=3)
1	Bacteriology	5	3	2	4	2
2	Virology	2	1	0	3	1
3	Parasitology	5	3	1	4	2
4	Mycology	1	1	1	1	0
5	Anatomy Pathology	0	1	0	1	0
6	Clinical Pathology	4	2	2	3	0
7	Hematology	6	1	2	3	3
8	Immunology	6	1	2	3	2
9	Environmental/Chemical	3	3	1	1	0

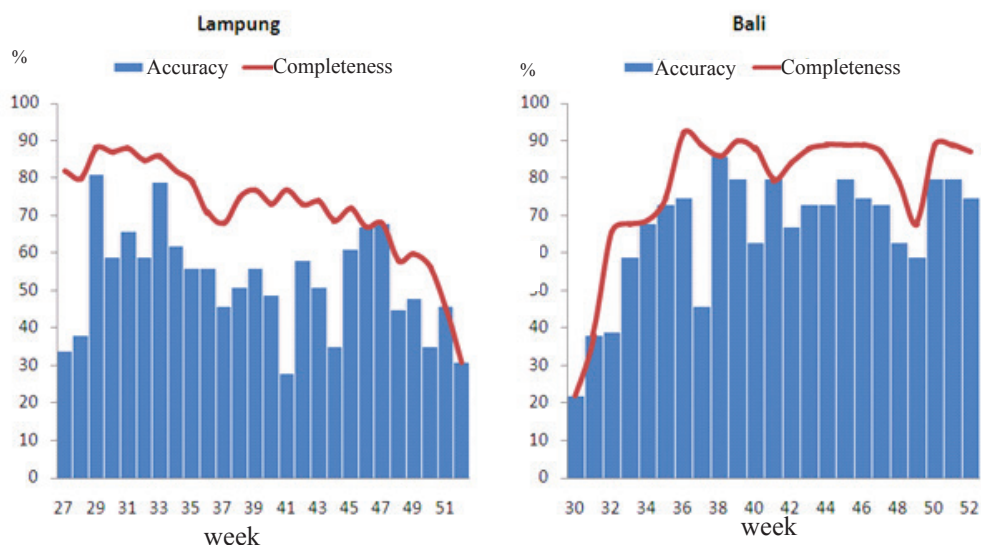n: Number of Laboratory Assessed

Figure 1. EWARS Performance in Lampung and Bali, 2009

laboratory testing for confirmation.

EWARS was introduced to South Sulawesi in 2009.[7] EWARS data from South Sulawesi was included in 2010 data. In 2010 and 2011, there are six provinces involved in EWARS, namely Lampung, Bali, South Sulawesi, North Sulawesi, South Kalimantan, and West Kalimantan. In 2010, a total of 1422 *Puskesmas* from 89 districts was involved in EWARS.[8] The completeness was high in Bali and Lampung (more than 80%), while the others were below 80% (Figure 3).

There were 19.033 alerts recorded in EWARS during 2010. Most of alerts have been verified (responded) by district or provincial health officers, but only a few of these was confirmed by laboratory testing. The highest response come from Bali with 91% and the lowest was West Kalimantan with 62% (Figure 4).

In 2011, the completeness was 80% nationally, except North Sulawesi (78%) and South Kalimantan (75%). Despite of the high result in completeness, the timeliness was still lower than 70% (Figure 5). There were 16.897 alerts recorded. Most of alerts
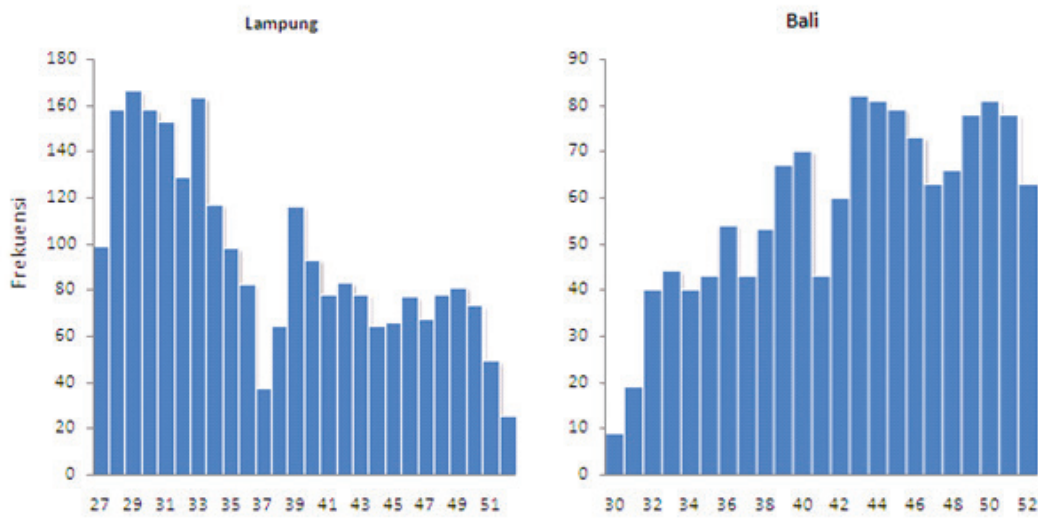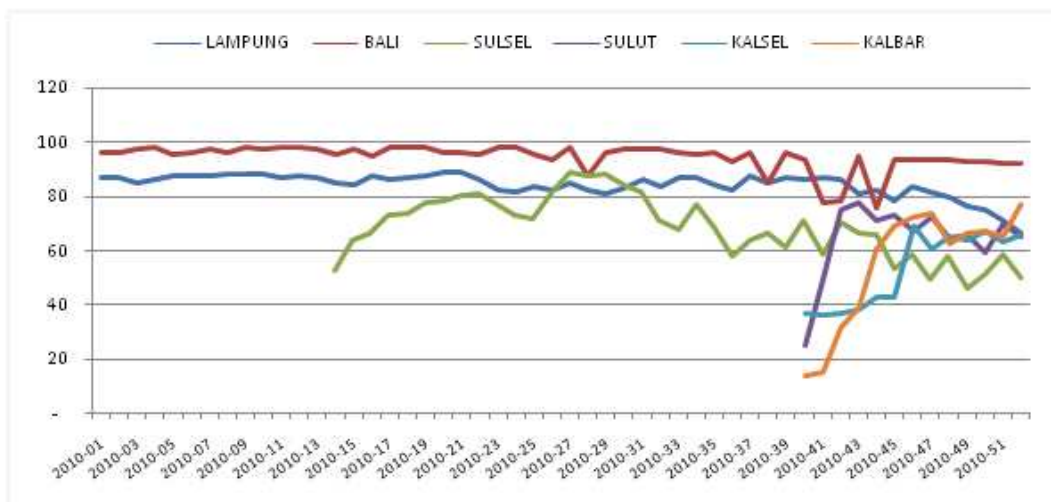

Figure 2. Frequency of Weekly Alert, EWARS 2009

Figure 3. Distribution of Completeness, EWARS 2010
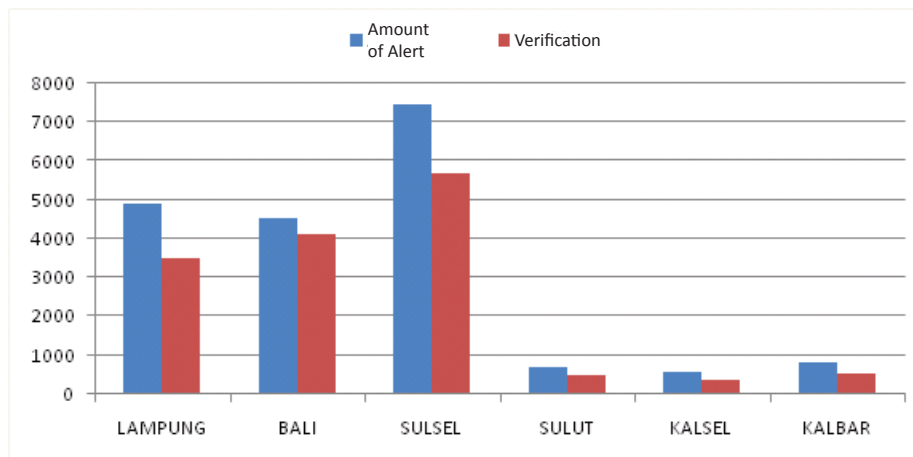
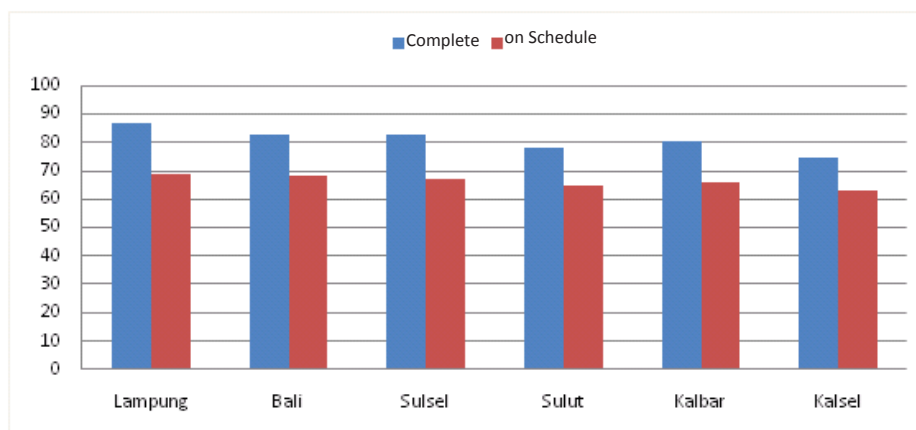*Figure 4. Distribution of Alert and Response, EWARS 2010*

Figure 5. Distribution of Completeness, EWARS 2011

(80%) were responded by the local health officers.[9]

From general assessment conducted in selected provinces (Lampung, Bali, and South Kalimantan) on March 2012, it was found that with EWARS, the completeness and timeliness of weekly early warning report increased than before. EWARS was sensitive enough to detect outbreaks. Less than 5% of alerts responded in EWARS was continue to be an outbreak.[10,11]

By using the laboratory capacity mapping tool, laboratory capacity assessment conducted in 9 provinces, which were Lampung, Bali, South Sulawesi, North Sulawesi, West Kalimantan, South Kalimantan, Banten, West Nusa Tenggara, and Central Java. It was found that acute diarrhea and measles are the commonest alerts detected by EWARS, reported from 6 provinces out of 9, followed by typhoid fever (4 out of 9), dog bite cases (3 out of 9), and ILI (3 out of 9). Almost all of the alerts have no laboratory testing for

confirmation. Some of the alerts that lead to certain disease such as measles, poliomyelitis, and malaria have had protocol for laboratory confirmation so that these alerts was tested by laboratory testing.

There are 18 laboratories that have been assessed for capacity in 5 provinces. The results of laboratory capacity mapping have shown below (Table 2). It was clear that almost all of the assessed laboratories have capacity on bacteriology testing (16 out of 18) while virology testing was only available in 7 out of 18 (none in Lampung). Some laboratories have limited capacities on testing priority diseases as needed to support EWARS. If there is a need to test specimen for certain disease that they have no capacity yet, the specimen will send to regional or national referral laboratory.

The laboratory capacity mapping tool could be used to find strengths and gaps of local laboratory facilities to support EWARS. It was found that there were some

limitations detected on specimen collecting, taking, packing, and shipping, as well as limited reagents availability, human resources capacity, coordination, and budget allocated for testing.

DISCUSSION

Early warning surveillance has been done in Indonesia for a long time ago before EWARS implementation, namely local area monitoring (PWS). The report of PWS was done by *Puskesmas* with weekly basis, but unfortunately the completeness was low. There are some diseases that potential to outbreak was reported with PWS, such as diarrhea, dengue fever, malaria, measles, etc., could be differ in different areas, and based on endemicity of the disease in certain areas. EWARS provides a simple way to report so that the participations of weekly reporting increase. It can be seen in Bali and Lampung when they started EWARS in 2009. The simple text messaging can improve the speed of reporting, effective and inexpensive.[12,13]

EWARS help local health officers to respond events timely to prevent outbreaks. The system is easy to use and could give information on weekly alerts and mapping. Most of *Puskesmas* have no problem with sending weekly report by SMS. Internet connection was available at almost all district health offices and at all province health offices. Alert monitoring by using EWARS could be used as an evaluation tool to see the quality of response conducted by local health officers or Rapid Response Team (RRT). The EWARS training with systematic curriculum was available. Some districts had already have trained RRT to conduct respond promptly. Although laboratory confirmation have not done for most of alerts detected by the system, in general, EWARS was well accepted in Lampung, Bali, and South Kalimantan, and gave beneficial to increase performance on early warning function.

EWARS provides rapid detection of alerts with geographic and automated data analysis at district, provincial, and central level. It makes regular identification of alerts on outbreaks and clusters of unusual events can be done. With the emergence of these signals, the District/Municipality/Provincial Health Officer will perform the appropriate verification and response as required timely. EWARS helps health officer and RRT to perform timely detections of outbreaks for priority diseases. It is not necessary to investigate all alerts based on disease endemicity; however, it is imperative to verify

alerts in new location, with new trends and different presentations.[6,14]

Besides, with the real time system, health officer from district, province, and central can simultaneously see the trend of the syndromes. In addition, the automated system provided in EWARS makes it easy for higher level to give weekly feedback to lower level. Thus, it will improve the completeness and timelines of the report.[12]

At the beginning of EWARS implementations in Bali and Lampung, there were no data available on the proportion of alerts that have been responded by health officer. As time goes by, there were a need to know the proportion of response to assess the performance of response. In 2010, the data on proportion of alerts that have been responded was available.

From the 2010-2011 data, it can be seen that there was many alerts detected by the system and most of them have been responded by health officer or RRT. However, only a few of these alerts was tested by laboratory examination, whereas EWARS is a syndrome surveillance system that should include early warning surveillance data and laboratory findings. The lack of laboratory data to support the EWARS also found in the surveillance system in low – middle income country such as India.[15] For the best result, EWARS should be supported by laboratories that have enough capacities to perform testing for priority diseases/syndromes. The limitation on conducting laboratory test for disease confirmation is not only because of the lack of laboratory capacity including the reagents and laboratory equipment, but also because of some constrains regarding availability of funding for specimen taking to testing, referral mechanism, and coordination between surveillance unit and laboratory unit.

It is necessary to conduct laboratory capacity mapping for local, regional, and national laboratories to have description on capacity of each laboratory and to identify capacity gaps to be addressed. The use of laboratory capacity mapping tool helps health authority to map the infrastructures, equipment, and logistics, as well as gaps and the needs of available laboratory, especially in province and district.

EWARS data and laboratory findings should be analyzed by trained epidemiologists. It is important to provide epidemiologists who responsible for EWARS at district, province, and central level. However the rapidity of the clinical epidemiology and laboratory notification will be different, it

depends with the variation of the pathogens to be identified.[16,17]

Finally, EWARS is an opportunity to strengthen overall sustainable surveillance system and health systems capacity. Strengthened surveillance capacity with laboratory and logistic function not only strengthen disease detection capacity but also to overall objectives of health system strengthening.

Inconclusion, EWARS is an opportunity to strengthen sustainable and sensitive surveillance system. The system is well accepted because of easy to use and increase the early warning performances.

In Indonesia, EWARS has not been fully supported by laboratory yet. The use of laboratory testing for disease confirmation on EWARS will contribute to evidence based outbreak detection and response.

Acknowledgments

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