

Electricity and risk of public health center had measles vaccine damage in Indonesia

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Abstrak

Latar belakang: Puskesmas yang memiliki vaksin campak rusak dipengaruhi oleh beberapa faktor risiko. Oleh karena itu perlu diidentifikasi beberapa faktor risiko dominan yang mempengaruhinya.

Metode: Analisis menggunakan sebagian data Riset Fasilitas Kesehatan (Rifaskes) tahun 2011. Rifaskes tersebut dilakukan di seluruh Puskesmas di 33 provinsi di Indonesia. Selanjutnya, pada analisis ini hanya menggunakan data Puskesmas di provinsi yang memiliki cakupan imunisasi campak di atas angka prevalensi nasional (81,6%), dan Puskesmas yang memiliki angka prevalensi campak di atas angka prevalensi nasional (1,18%). Analisis data statistik dilakukan dengan menggunakan analisis regresi logistik untuk menentukan beberapa faktor risiko dominan yang mempengaruhi Puskesmas yang memiliki vaksin campak rusak.

Hasil: Sebanyak 7 (Riau, Jakarta, Nusa Tenggara Barat, Nusa Tenggara Timur, Sulawesi Tengah, Sulawesi Selatan, Gorontalo) sebanyak 1259 Puskesmas memenuhi kriteria inklusi. Puskesmas yang berlokasi di perdesaan dibandingkan dengan perkotaan berisiko 3,4 kali lipat yang merupakan Puskesmas yang memiliki vaksin campak rusak [rasio odds suaian (ORa) = 3,37; 95% interval kepercayaan (CI) = 1,34-8,26]. Selanjutnya, Puskesmas dengan ketersediaan listrik PLN kurang dari 24 jam dibandingkan dengan tersedia selama 24 jam mempunyai risiko 2,1 kali lipat merupakan Puskesmas yang memiliki vaksin campak rusak (ORa = 2,10; 95% CI = 1,02-4,33).

Kesimpulan: Puskesmas yang mempunyai kerusakan vaksin campak yang rusak lebih banyak terjadi di Puskesmas di perdesaan dan yang tidak tersedia listrik PLN maupun ketersediaan listrik sehari-hari kurang dari 24 jam merupakan Puskesmas yang memiliki vaksin campak rusak. (*Health Science Journal of Indonesia 2015;6:116-20*)

Kata kunci: vaksin campak rusak, Puskesmas

Abstract

Background: The Public Health Center (PHC) had broken measles vaccine was influenced by a number of risk factors. Therefore, it was necessary to identify some dominant risk factors that related to PHC had measles damage vaccines.

Methods: The analysis used a part of the data of Research Health Facilities (Rifaskes) in 2011. The Rifaskes was conducted in all health centers in all (33) provinces in Indonesia. Furthermore, this analysis uses data only health center in the province who have measles immunization coverage the national prevalence rate (81.6%) or more, and health centers that have measles prevalence rate above the national prevalence rate (1.18%) or more. Statistical data analysis performed using logistic regression analysis to determine some of the risk factors related to the health center had has measles vaccine damaged.

Results: A number of 7 provinces (Riau, Jakarta, West Nusa Tenggara, East Nusa Tenggara, Central Sulawesi, South Sulawesi, Gorontalo) with 1259 PHC met the inclusion criteria. Health centers located in rural areas compared with urban areas had 3.4-fold risk of a PHC that had measles damage vaccines [adjusted odds ratio (ORa) = 3.37; 95% confidence interval (CI) = 1.34 - 8.26]. Furthermore, the health center with the availability of the electricity for less than 24 hours compared with available 24 hours had 2.1-fold risk of PHC that had measles damage vaccines (ORa = 2.10; 95% CI = 1.02 - 4.33).

Conclusion: Public health center in rural areas, or did not have not have commercial electric power, or did not have the availability of day-to-day electricity less than 24 hours had more risk of a PHC that had measles damage vaccines. (*Health Science Journal of Indonesia 2015;6:116-20*)

Keywords: measles, public health center, vaccine

Measles can be prevented by immunization and has been included in the national immunization program. Indonesian data in 2007 based on diagnosis and health professionals complaints of respondents, showed measles national prevalence was 1.18%, and immunization coverage for measles was 81.6%.^{1,2} It means that Indonesia had high measles immunization coverage, on the other hand, the prevalence was still also high.

Indicators of good quality vaccine, including measles vaccine, management is characterized, among others, by maintained temperature of 2-8°C, no damaged vaccine, and has not exceeded the expired date.^{3,4}

High immunization coverage does not imply measles prevalence would low, unless the quality of vaccines is guaranteed. Vaccine quality is not only determined by laboratory tests (test potential vaccines), but also highly dependent on the quality of vaccine management in particular at Public Health Center (PHC).

Indonesia is a country with thousands of PHCs which have various conditions that will influenced the quality vaccine, including measles vaccine. Some PHCs had measles vaccine damage. Therefore, it is necessary to identify the risk factors associated with PHCs which had measles vaccine damage.

This analysis aimed to identify dominant risk factors related to PHC which had damage measles vaccines in the provinces with high immunization coverage, however, having high prevalence measles cases.

METHODS

This analysis used a part of National Health Facility Research (Rifaskes) PHC data in 2011. The research had ethical approval from Ethic Committee of the National Institute of Health Research and Development (NIHRD) of the Ministry of Health of Indonesia. This cross-sectional Rifaskes PHC study was conducted by NIHRD, in 8737 PHCs located in all (33) provinces in Indonesia.

This design is a part of the overall Rifaskes study in 2011.⁵ The overall design among others, are: Data collected comprised of a data facility, human resources (HR), medical equipment, organization and management, health services were running, and the output of essential health services, as well as the functions of the Quality Indicators Essential Health Center in 2010. The data were collected by PHC Rifaskes 2011 using a questionnaire consisting of 16 blocks. Data were collected through interviews, observation, and assessment of secondary data.

Data collectors were researchers of NIHRD, health polytechnic (polytechnic), university/college, professional organizations, or other medical research institutions that met the required criteria, both at the national and provincial / district / city.

The validity of the study carried out by three School of Public Health (FKM) in Indonesia is leading School of Public Health of: the Universitas Indonesia, University of Hasanudin, and Universitas Airlangga. The validation process carried out 1-2 weeks after the enumerators to collect data. The results were good data collection process and the validity of the data collected had average of more than 80%. So it can be concluded that the process of data on Rifaskes 2011 was valid.

Furthermore, this analysis used data among PHCs in the province with measles immunization coverage prevalence rate (81.6%) or more, and health centers that had measles prevalence rate national prevalence rate (1.18%) or more.²

For this analysis, a number of 1259 PHCs in 7 provinces (Riau, Jakarta, West Nusa Tenggara, East Nusa Tenggara, Central Sulawesi, South Sulawesi, and Gorontalo) full filled the inclusion criteria.

PHCs which had measles vaccines damage in Rifaskes 2011 were categorized into 'yes' and 'no'. Measles vaccines damage are measles vaccines indamage condition vaccine vial monitor (VVM) indicator C and D) and expired. Public health center location was categorized into 2 categories (urban and rural). Personnel participation in immunization-related training was divided into two categories (complete and incomplete). Completeness of manuals and training materials were divided into two groups (complete and incomplete). Vaccine stock records were categorized into 3 categories (available and complete, available and incomplete, unavailable).

Temperature record chart was divided into 3 categories (available and complete, available and incomplete, unavailable). Vaccine storage availability was divided into 2 groups (refrigerator and others). Thermometer availability was divided into 2 groups (available and unavailable). Completeness of vaccine carrier tools consisting of cold boxes/ vaccine carrier/ flask accompanied with cool packs was divided into two categories (complete and incomplete). Electricity availability at public health center was divided into 2 categories (24 hours and <24 hours). Statistical data analysis was performed using logistic regression.

RESULTS

Table 1 shows that in general, there was 3.5% PHCs which had damage vaccines in 7 provinces. East Nusa Tenggara had the highest PHCs which had damage measles vaccines among other provinces which had PHCs with damage measles vaccines while Gorontalo had the lowest proportion of damage measles vaccines.

Table 1. Distribution of PHC which had damage vaccines by province

Province	PHC had measles vaccine damaged			
	No		Yes	
	n	%	n	%
Riau	142	11.3	5	0.4
Jakarta	285	22.6	2	0.2
West Nusa Tenggara	115	9.1	3	0.2
East Nusa Tenggara	173	13.7	17	1.4
Central Sulawesi	100	7.9	12	1
South Sulawesi	339	26.9	5	0.4
Gorontalo	61	4.8	0	0
Total	1215	96.5	44	3.5

Table 2 shows that PHCs which had damage measles vaccines were similarly distributed in term of personnel participation in immunization related-training, completeness of manual and training materials, vaccine stock record, temperature record chart, and completeness of vaccine carrier tools. Compared to PHCs which had refrigerator and thermometer, those which had others vaccine storage and did not have thermometer were more likely to had higher risk of PHCs had damage measles vaccines.

Table 3 shows that rural area of PHCs ($P = 0.008$) and availability of government electricity less than 24 hours or not available ($P = 0.044$) were dominant factors related to PHCs which had measles vaccines damage compare with urban area and availability of government electricity for 24 hours.

Table 2. Several characteristics and risk of public health center had measles vaccine damaged

Variable	PHC had measles vaccine damaged				Crude odd ratio	95% confidence interval	P
	No		Yes				
	(n=1215)		(n= 44)				
	n	%	n	%			
Personnel participation in immunization related-training							
Complete	267	22.0	7	15.9	1.00	Reference	0.440
Incomplete	948	78.0	37	84.1	1.49	0.66 - 3.38	
Completeness of manual and training materials							
Complete	440	36.2	16	36.4	1.00	Reference	1.000
Incomplete	775	63.8	28	63.6	0.99	0.53 - 1.86	
Vaccine stock record							
Available, complete	969	79.8	38	86.4	1.00	Reference	0.462
Available, incomplete	151	12.4	4	9.1	0.68	0.24 - 1.92	
Unavailable	95	7.8	2	4.5	0.13	0.13 - 2.26	
Temperature record chart							
Available, complete	836	68.8	29	65.9	1.00	Reference	0.216
Available, incomplete	155	12.8	3	6.8	0.56	0.17 - 1.85	
Unavailable	224	18.4	12	27.3	1.54	0.78 - 3.08	
Vaccine storage availability							
Refrigerator	1157	95.2	39	88.6	1.00	Reference	0.064
Others	58	4.8	5	11.4	2.56	0.97 - 6.73	
Thermometer availability							
Available	1062	87.4	33	75.0	1.00	Reference	0.030
Unavailable	153	12.6	11	25.0	2.31	1.15 - 4.67	
Completeness of vaccine carrier tools							
Complete	1128	92.8	40	90.9	1.00	Reference	0.628
Incomplete	87	7.2	4	9.1	1.30	0.45 - 3.71	

Table 3. Dominant factors related to public health center had measles vaccine damaged

	PHC had measles vaccine damaged				Adjusted odd ratio*	95% confidence interval	P
	No (n=1215)		Yes (n=44)				
	n	%	n	%			
Location							
Urban	482	39.7	6	13.6	1.00	Reference	
Rural	733	60.3	38	86.4	3.37	1.34 - 8.26	0.008
Government electricity availability							
24 hours	1081	89.0	32	72.7	1.00	Reference	
Less than 24 hours or not available	134	11.0	12	27.3	2.1	1.02 – 4.33	0.044

*Adjusted each other between variables listed on this table

DISCUSSION

In interpreting the results, this analysis had several limitations, in particular, the data came from a national survey conducted by the Ministry of Health. Various attempts had been made to obtain good data: training activities for collecting data such as practice on doing an interview and fill out the questionnaire.

In addition, we did not have any data regarding PHC personnel knowledge, personnel working period, personnel commitment, as well as refrigerator function that related to the vaccine damage.

In some districts in East Nusa Tenggara, the prevalence of measles was was 1.7% or higher. While the numbers of measles immunization coverage in the province amounted to 94.1%, higher than the national average of 81.6% coverage.⁶

Electrification ratio in East Nusa Tenggara in 2013 still amounted to 48.3%. On the other hand, province of Gorontalo had 64.04%. Differences in the distribution of electricity in parts of Indonesia may effect to electricity supply.⁷ Availability of electricity for 24 hours is required for the sustainability of vaccine storage in refrigerator. If measles vaccine is not stored at appropriate temperature, 2-8 °C, vaccine will be quickly broken. Measles vaccine damage is characterized by discoloration of the indicator VVM into condition C and D in which vaccine can not be reused.⁸

Prior study in two PHCs at Depok (West Java) noted that vaccine storage quality was depended on the electricity, and in case of a power outage, electrical continuity can not be assured because PHCs did not have a generator.⁹

Another study conducted in a private provider offices in Georgia (USA) showed that the major risk factors related to vaccine storage were lack of thermometer in freezer and lack of thermometer in refrigerator.¹⁰ While a study in Semarang (Central Java) showed

that the influence factors related to vaccine damage was unavailability of guidelines, personnel lack of knowledge, thermometer unavailability, and inappropriate transported vaccines.¹¹

A previous study in Malaysia showed that intervention to health care such as training, providing resources and material education, and giving additional incentives gave significant improvement in vaccine handling, such as correct vaccine placement, temperature maintenance in 2-8°C, and temperature monitoring.¹²

In addition, incomplete vaccination also associated with public accessibility to health facilities. Failure in appropriate vaccine storage and handling can reduce vaccine potency, inadequate immune response, and a weak defense against disease. It also can reduce public confidence in the vaccine and vaccination providers when it was happened again and cause losses cost if the vaccine can not be used.¹³

In conclusion, measles vaccine damages were more occurred in PHC located in rural area and the electricity availability less than 24 hours or not available. Therefore, it is suggested that government should provide electricity for 24 hours in PHC.

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