

Factors Associated with the Second Dose of Measles Immunization in Children Under Two Years: An ecological Study

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Abstract

Measles is one of the leading causes of morbidity, mortality, and disability in children under two years worldwide. The study aimed to analyze factors associated with the second dose of measles immunization in children under two years in 2019 in Indonesia. The study carried out the ecological analysis using secondary data from the 2019 Indonesian Health Profile. The Ministry of Health of the Republic of Indonesia reported that in 2019. The study takes 34 provinces as samples. The dependent variable is the coverage of the second dose of measles immunization in children under two years. The independent variable is the ratio of primary health centers per district by province, the percentage of primary health centers with sufficient nurses, and the percentage of primary health centers with enough midwives. The results showed that three variables tended to be related to the second dose of measles immunization in children under two years. The three variables consist of the ratio of primary health center per district, percentage of the primary health center with sufficient nurses, and percentage of the primary health center with enough midwives. The study concluded that the three independent variables analyzed tended to correlate with the coverage of the second dose of measles immunization in children under two years.

Keywords: *the second dose of measles immunization, measles, ecological study.*

Background

Measles is a severe acute viral infectious disease that is highly contagious. Measles is caused by Paramyxovirus and is transmitted mainly by air (airborne). The transmission attack rate is more than 90% of infected individuals from 4 days before to 4 hours after the rash's appearance. This disease's incubation period occurs at 7-18 days¹. Measles is believed to be the leading cause of death in children worldwide². Immunization has reduced measles transmission worldwide, a decrease of 73% between 2000-2018 worldwide, so a Measles-

Rubella (MR) campaign was launched to vaccinate all children between 9 months and 15 years of age³.

Over the years, the global coverage for measles' first dose is 85%, while the second dose is 67%. This immunization coverage is less than 95%, which is needed to prevent an outbreak¹. After carrying out essential compulsory vaccination, the second dose of measles is one immunization type that gets more attention. The attention is following Indonesia's obligation to the world to participate in preventing measles and rubella in 2020. The participation is to achieve measles coverage at any level of 95% in all zone⁴.

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The coverage of the measles immunization program in Indonesia in 2019 is 95.14%. This figure has met the target of 95%. The second dose of measles immunization coverage pattern for the last ten years has consistently

been above 90%. However, when compared to data from Riskesdas 2018, there were differences, especially in children aged 12-23 months who received the measles vaccination, which is only 77.3%⁴. Areas in Indonesia with the lowest coverage of the second dose of measles immunization are Aceh (50.16%) and Papua (69.98%)⁴. The study aimed to analyze factors associated with the second dose of measles immunization in children under two years in 2019 in Indonesia.

Materials and Methods

Study Design

The authors designed the study using an ecological analysis approach. Ecological studies focus on comparisons between groups, not individuals. The data analyzed is aggregate data at a particular group or level, which in this study is the provincial level. An ecological analysis variable can be aggregate measurements, environmental measurements, or global measurements^{5,6}.

Data Source

The authors conduct the study using secondary data

from the 2019 Indonesia Health Profile report⁷.

Data Analysis

This study's dependent variable is the coverage of the second dose of measles immunization in children under two years in 2019. In addition to the coverage of the second dose of measles immunization in children under two years 2019 as the dependent variable, there are three independent variables analyzed in this study, namely the ratio of primary health center per sub-district, percentage of the primary health center with sufficient nurses, percentage of the primary health center with sufficient midwives by province. The public health center, following the provisions to Regulation 75/2014 of the Minister of Health. The public health center has been defined as a public health service that organizes the community by prioritizing health promotion and prevention to achieve the highest public health status in its work area⁸. Data were analyzed bivariate by using cross-tabulation. The entire analysis process utilizes SPSS 23 software.

Results and Discussion

Table 1. Descriptive statistics of variables second dose of measles immunization under in children two years in Indonesia in 2019

Statistics	The coverage of the second dose of measles immunization in children under two years	The ratio of the primary health center in sub-district by province	Percentage of the primary health center with sufficient nurses	Percentage of the primary health center with sufficient midwives
N	34	34	34	34
Mean	64.33	1.57	5.70	3.77
Median	62.50	1.41	4.67	2.57
Mode	25.60a	1.36a	00.00	00.00
Std. Deviation	18.75	1.03	4.17	3.37
Variance	351.67	1,063	17.44	11.40
Range	72.20	6.88	19.01	12.93
Minimum	25.60	0.28	0.00	0.00
Maximum	97.80	7,16	19.01	12.93

Source: The 2019 Indonesia Health Profile

Table 1 provides descriptive statistics of all variables analyzed in this study. Based on table 2, it is found that the dependent variable coverage of second dose measles immunization has a minimum value of 25.60, a maximum value of 97.80, so that it has a range

of 72.20. Whereas for the independent variable, the ratio of primary health center per district has a minimum value of 0.28, a maximum value of 7.16, so it has a range of 6.88. The percentage of primary health centers with sufficient nurses and primary health centers with sufficient midwives ranged from 19.01 and 12.93.

Table 2. Cross-tabulation the coverage of second dose of measles immunization under in children two years and the ratio of the primary health center in sub-districts by the province in 2019

The ratio of the primary health center in sub-district by province	The coverage of second dose measles immunization in children under two years					
	Low (25.60 - 49.66)		Middle (49.67- 73.72)		High (73.73 - 97.80)	
	N	%	N	%	N	%
Low (0.28 - 2.576)	9	26.47	13	38.23	11	32.35
Middle (2.57 - 4.86)	0	0	0	0	0	0
High (4.87– 7.16)	0	0	0	0	1	2.94
Total	9	26.47	13	38.23	12	38.23

Source: The 2019 Indonesia Health Profile

Based on Table 2, the coverage of second dose measles immunization in children under two years is in the high category, with the primary health center's ratio in sub-districts by province being in the high class having the lowest percentage (2.94%).

Table 3. Cross-tabulation the coverage of second dose measles immunization under in children two years and the percentage of the primary health center with sufficient nurses in 2019

Percentage of the primary health center with sufficient nurses	The coverage of second dose measles immunization in children under two years					
	Low (25.60 - 49.66)		Middle (49.67- 73.72)		High (73.73 - 97.80)	
	N	%	N	%	N	%
Low (0 - 6.33)	1	2.94	5	14.70	1	2.94
Middle (6,34 –12,66)	5	14.70	5	14.70	8	23.52
High (12.67 - 19.01)	3	8.82	3	8.82	3	8.82
Total	9	26.46	13	38.23	12	35.28

Source: The 2019 Indonesia Health Profile

Based on table 3, the coverage of second dose of measles immunization underin children two years in the high category and the percentage of the primary health center with sufficient nurses in the medium category had

a higher percentage (23.52%). Whereas in the category of the percentage of the primary health center with high nurse adequacy, the category of immunization coverage was low with a low percentage (8.82%).

Table 4. Cross-tabulation the coverage of second dose measles immunization in children under two years and the percentage of the primary health center with sufficient midwives in 2019

Percentage of the primary health center with sufficient midwives	The coverage of second dose measles immunization in children under two years					
	Low (25.60 - 49.66)		Middle (49.67- 73.72)		High (73.73 - 97.80)	
	N	%	N	%	N	%
Low (0 - 4.30)	3	8.82	6	17.64	8	23.52
Middle (4.30 - 8.61)	4	11.76	4	11.76	4	11.76
High (8.61 - 12.93)	2	5.88	3	8.82	0	0
Total	9	26.47	13	38.23	12	35.29

Source: The 2019 Indonesia Health Profile

Based on Table 4, it can be seen that based on the coverage of the second dose of measles immunization in children under two years in the high category, the percentage of the primary health center with low midwifery adequacy category has the highest percentage (23.52%). While the coverage of second dose measles immunization for children under two years was in a low category, the primary health center's percentage with sufficient midwives in the high category had a low percentage (5.88%).

The existence of significant differences in immunization coverage between provinces is evidenced by the reasonably high range value, namely 72.20. Following the 2019 Indonesia health profile data stated areas in Indonesia with the lowest coverage of second dose measles immunization, namely Aceh (50.16%) and Papua (69.98%)⁷. In another study, it was stated that there was a relationship between the recording and reporting system at the primary health center and the measles immunization coverage⁹. Measles immunization coverage is also influenced by several

factors, including the knowledge of mothers aged 18-24 months about advanced DPT and measles immunization is lacking, so they do not bring their children for further measles immunization¹⁰.

The percentage of primary health centers with sufficient nurses and the rate of primary health centers with sufficient midwives ranged from 19.01 and 12.93. The government cannot distribute personnel in the Java-Bali region the same as in Sumatra and Indonesia's eastern area. The number of auxiliary primary health center personnel varies greatly between Java-Bali, Sumatra, and eastern Indonesia. The distribution shows sufficient personnel in Java-Bali so that the auxiliary primary health center can be filled with adequate personnel^{11,12}.

The coverage of second dose measles immunization in children under two years was in the high category. The primary health center ratio in sub-districts by province was in the high category, having the lowest percentage (2.94%). This information shows a tendency for a positive relationship between the coverage of second

dose measles immunization in children under two years and the ratio of the primary health center in sub-districts by province. The primary health center is responsible for administering health efforts for the first level¹³. Access to health facilities with geographical situations and conditions is a big challenge in providing immunization services evenly throughout Indonesia. Based on the results of previous research on the effect of access to health facilities on completeness of immunization for children under two years, it was found that there was a significant relationship between travel times to health facilities. Travel time to non-community-based health care facilities with complete immunization for children under two years after being controlled by maternal age variables, maternal education, maternal occupation, family socioeconomic status, and area of residence¹⁴. The primary health center's success in running the program is determined by human resources that are balanced between medical personnel and promotive and preventive personnel on the other hand¹⁵.

The primary health center percentage with sufficient nurses to cover second dose measles immunization under two years children was high. In contrast, in the category of the primary health center percentage with high nurse adequacy, immunization coverage in the low category resulted in a low percentage. This information shows a trend towards a positive relationship between the coverage of second dose measles immunization in children under two years with the percentage of the primary health center with nurses' adequacy. From the results of several studies and discussions, it can be concluded that there is a relationship between the presence of immunization officers, availability of vaccines, work motivation of immunization implementers, recording and reporting systems, community motivation in immunization, and coverage of advanced measles immunization⁹. Similar to the research results stating that health worker density is positively related to vaccination coverage of children in developing countries. The interpretation is that a higher density of health workers, including nurses, increases the availability of vaccination services over time and space, making it more likely that children will be vaccinated¹⁶.

The second dose of measles immunization coverage for under two years children was in the high category;

the primary health center's percentage with sufficient midwives in the low category had the highest rate. While the second dose of measles immunization coverage for under two years children was in a low category, the primary health center's percentage with sufficient midwives in the high category had a low percentage. These results indicate a trend towards a positive relationship between the coverage of the second dose of measles immunization in children under two years with the percentage of the primary health center with nurses' adequacy. Nurses' and midwives' geographic distribution is better than that of doctors, but there are still disparities.

Based on the Ministry of Health's latest data, most nurses and midwives are located in Java and Sumatra islands compared to Papua, NTT, and Maluku islands. The lack of percentage of the primary health center with sufficient nurses and midwives in Indonesia will affect immunization coverage. Only a few provinces meet the WHO recommended ratio, namely, 1.58 nurses and 0.75 midwives per 1000 population¹⁷. Although the ratio of midwives was still below standard, several provinces were able to show better performance in the MCH program than those that met the ratio¹⁸. In other research, it was found that there was a relationship between the role of health workers at the primary health center with a history of immunization. We hoped that the primary health center would continue to increase education about vaccination benefits by making direct visits to the community, especially in social and religious activities¹⁹.

Conclusions

The study concluded that the three independent variables analyzed tended to correlate with the coverage of the second dose of measles immunization in children under two years. The three variables are a ratio of primary health center per district, the percentage of primary health center with sufficient nurses, and the percentage of primary health centers with enough midwives.

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Ethical Clearance: The study conducted using secondary data from published reports. Ethical clearance is therefore not required in the conduct of this study.

Conflicting Interests: Nil

References

- Iriani AA dan Y, IDAI UI dan PT. What is Measles Infection? (Apakah Infeksi Campak?). 2019.
- Feikin DR, Flannery B, Hamel MJ, Stack M, Hansen PM. Vaccines for Children in Low- and Middle-Income Countries. In: Disease Control Priorities, Third Edition (Volume 2): Reproductive, Maternal, Newborn, and Child Health. 2016.
- Krishnamoorthy Y, Kannusamy S, Sarveswaran G, Majella M, Sarkar S, Narayanan V. Factors related to vaccine hesitancy during the implementation of Measles-Rubella campaign 2017 in rural Puducherry-A mixed-method study. *Journal of Family Medicine and Primary Care*. 2019.
- National Institute of Health Research and Development of The Indonesia Ministry of Health. The 2018 Indonesia Basic Health Survey (Riskesdas): National Report [Internet]. Jakarta; 2019. Available from: http://labmandat.litbang.depkes.go.id/images/download/laporan/RKD/2018/Laporan%7B%5C_%7DNasional%7B%5C_%7DRKD2018%7B%5C_%7DFINAL.pdf
- Laksono AD, Kusriani I. Ecological Analysis of Stunted Toddler in Indonesia. *Indian J Forensic Med Toxicol*. 2020;14(3):1685–91.
- Utami SM, Handayani F, Hidayah M, Wulandari RD, Laksono AD. Ecological Analysis of Preeclampsia/Eclampsia Case in Sidoarjo Regency, Indonesia, 2015-2019. *Indian J Forensic Med Toxicol*. 2020;14(4):3474–9.
- Profil Kesehatan Indonesia. The 2019 Indonesia basic health survey (Riskesdas) : National Report. Vol. 53, *Journal of Chemical Information and Modeling*. 2019. Kementerian Kesehatan Republik Indonesia, 1689-1699.
- The Minister of Health of the Republic of Indonesia. Peraturan Menteri Kesehatan Republik Indonesia No. 75 Tahun 2014 Tentang Pusat Kesehatan Masyarakat. Jakarta: Kementerian Kesehatan Republik Indonesia; 2014.
- Arfiyanti A. Faktor-faktor yang Berhubungan Dengan Cakupan Imunisasi Campak di Kabupaten Tegal. *Jurnal Jur Ilmu Kesehat Masy , Fak Ilmu Keolahragaan, Univ Negri Semarang* 2009. 2019;
- Rofiasari L, Yunita S, Universitas P, Kencana B. Pengetahuan Ibu Tentang Imunisasi Booster DPT Dan Campak Mother's Knowledge About DPT Booster And Campak Immunization. *J Ilm Kebidanan*. 2020;
- Laksono AD, Wulandari RD, Soedirham O. Regional Disparities of Health Center Utilization in Rural Indonesia. *Malaysian J Public Heal Med*. 2019;19(1).
- Husain I. Kualitas dan Kuantitas Tenaga Kesehatan Puskesmas. *Stud Distrib Desa-Kota dan Reg Anal Data SAKERTI 2000*. 2006;(18).
- Menteri K, Republik K, Nomor I, Kebijakan T, Pusat D, Masyarakat K, et al. Keputusan menteri kesehatan republik indonesia nomor 128/menkes/SK/II/2004. 2010 p. 1–2.
- Nainggolan O, Hapsari D, Indrawati L. Pengaruh Akses ke Fasilitas Kesehatan terhadap Kelengkapan Imunisasi Baduta (Analisis Riskesdas 2013). *Media Penelit dan Pengemb Kesehat*. 2016;26(1):15–28.
- Tim Pengajar FKM-UNSRAT. Konsep dasar dan sistem informasi kesehatan. 2017.
- Anand S, Bärnighausen T. Health workers and vaccination coverage in developing countries: an econometric analysis. *Lancet (London, England)*. 2007 Apr;369(9569):1277–85.
- Mahendradhata Y, Trisnantoro L, Listyadewi S, Soewondo P, MArthias T, Harimurti P, et al. The Republic of Indonesia Health System Review. Vol. 7. 2017. 1 p.
- Wulandari RD, Laksono AD. Hubungan Antara Rasio Bidan Dengan Kinerja Program Kesehatan Ibu Dan Anak Di Indonesia. *Bul Penelit Sist Kesehat*. 2019;22(3).
- Arista D, Hozana H. Hubungan Tingkat Pendidikan, Dukungan Keluarga dan Peran Tenaga Kesehatan dengan Riwayat Pemberian Imunisasi Dasar pada Bayi di Wilayah Kerja Puskesmas Paal V Kota Jambi Tahun 2016. *Sci J*. 2016;5(2):157–66.