

Coverage and factors associated with complete polio vaccination

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Coverage and factors associated with complete polio vaccination among Indonesian children aged 0–18 months

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ABSTRACT

Introduction: The polio vaccine is one of the vaccinations required for all children by the government of Indonesia. However, polio vaccination coverage has not yet reached its maximum. This study aimed to analyze the coverage and factors associated with complete polio vaccination among Indonesian children aged 0–18 months.

Methods: A cross-sectional design used observation data drawn from the Demographic and Health Survey 2017. A total of 5378 respondents were obtained through the two-stage stratified cluster sampling technique. The questionnaire included DHS Questionnaire Phase 7. The variables include the mother's age, education level, wealth quintile, residence, number of living children, marital status, visit to a health facility, health insurance, whether currently employed, household head gender, and complete polio vaccination. The data were analyzed using chi-square and binary logistic regression.

Results: Based on DHS 2017, 35.83% of Indonesian children aged 0–18 months received the complete polio vaccination. The factors associated with complete polio vaccination were mother's age 15–24 years old, secondary education level, wealth quintile, visit to a health facility, and current employment. The number of living children, marital status, health insurance, and household head gender were not associated with complete polio vaccination.

Conclusion: To achieve the target coverage of the polio vaccination, the Indonesian government needs to consider factors such as the mother's age, education level, wealth quintile, recent visits to a health facility, employment and other factors. In addition, optimization by increasing the availability of information on the importance of polio vaccination is needed.

1. Introduction

The polio vaccination is an attempt to provide immunity to the poliovirus. Polio vaccines are given when the child is newborn (polio-0) and at 2 months of age (polio-1), 3 months of age (polio-2) and 4 months of age (polio-3) as the optimum dose and again at the age of 18 months as a booster dose (Indonesian Pediatric Society, 2017). There are an estimated 1000 deaths per year due to polio; the incidence rate is 1 per 1000 among children under 5 years old, and the case fatality rate is 2.5% in developed countries and 10.0% in Sub-Saharan Africa (Jamison et al., 2006). Poliomyelitis or irreversible paralysis occurred in Southeast Asia during the polio outbreaks in Indonesia and Myanmar (Global Polio Eradication Initiative, 2020). Polio outbreaks were reported in Myanmar with 4 cases in 2007 and 2 cases in 2015; routine

immunization coverage was estimated at 91% for three doses of bivalent oral polio vaccine in 2018 (World Health Organization, 2019). An outbreak of polio cases in Indonesia was declared due to the finding of one polio case in Yahukimo District, Papua (Health Ministry of Republic Indonesia, 2020).

The timeliness and completeness of the vaccination series is the key to controlling vaccination-preventable diseases. One such vaccination is the polio vaccination to prevent poliomyelitis. An adequate and timely course of vaccinations is needed to prevent the transmission of the disease in children (Mekonnen, Gelaye, Were, & Tilahun, 2020). Delayed or inadequate vaccination results in increased mortality and morbidity of vaccination-preventable diseases (Jamison et al., 2006).

There are many factors associated with timely and complete polio vaccination delivery. Some of the latest research abroad has shown that

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paternal, maternal, and economic factors are associated with the administration of polio vaccinations. Maternal factors such as the mother's age (Arooj, Ali, Baber, Abbasi, & Ali, 2013; Choudhary, Solomon, Awale, & Dey, 2018; Khan, Zaheer, & Shafique, 2017), education (Choudhary et al., 2018; Khan et al., 2017; Weiss, Choudhary, & Solomon, 2013), and empowerment (Khan et al., 2017) are associated with polio vaccination coverage. The paternal factors associated with polio vaccination coverage include the father's education (Arooj et al., 2013; Choudhary et al., 2018) and occupation (Arooj et al., 2013). The wealth index or economic status (Arooj et al., 2013; Choudhary et al., 2018; Khan et al., 2017) and residence (Arooj et al., 2013; Khan et al., 2017) have also become associated factors. Research on the coverage of the polio vaccination in Indonesia is still limited. Previous research in Indonesia only discussed the matter at the subdistrict and district levels. Associated factors include family support (Fitria, Fawziyah, & Erfiana, 2016; Harizon, Misnaniarti, & Idris, 2020), health workers' support, and mothers' knowledge (Harizon et al., 2020). Therefore, the results of this research present new findings to determine polio vaccine coverage nationally.

Indonesia is a large country with diversity in each region. Previous research on polio vaccination coverage on a small scope, such as districts and cities, cannot be generalized to reveal the current national condition. Moreover, Indonesia was once one of the countries in the outbreak category of polio cases. Given this situation, research with national coverage data must be conducted on the factors associated with complete polio vaccination. The results can be part of the foundation for making policies to increase the coverage of polio vaccinations. Indonesia has again become a zero-polio-case country and seeks to maintain this status.

2. Materials and methods

2.1. Study design

This study used a cross-sectional design with secondary data from the Indonesian Demographic Health Survey (IDHS) 2017. The survey was conducted in December 2017. The IDHS collaborates with the government in Indonesia and with the Inner-City Fund (ICF) International. Ethical clearance in this study was provided by the Ministry of Health of Indonesia. Permission to use the dataset was obtained from ICF International, part of the Demographic Health Survey program. The researchers also obtained approval for the use of the IDHS data from the ICF.

2.2. Sample

To obtain the data, the researchers used the IDKR71FL (Indonesian Kids Recode Phase 7) data set in this study. The data set contains information about health status for children under 5 years old as an indicator. In this study, the age of the children was set as 0–18 months. The researchers selected children aged 0–18 years in this study according to the standards set by the Indonesian government for optimum administration (age 0–4 months) and booster dose (18 months) (Indonesian Pediatric Society, 2017). In addition, data on mothers' information in relation to children were used in this study. The sample was obtained through a two-stage stratified cluster sampling technique including select clusters from each stratum and a list of households in selected clusters. The researchers then selected the households to be interviewed (Survey, 2017). The researchers used the data of children who had received a complete polio vaccination series, which were obtained from the mothers interviewed in the IDHS 2017. The total population was 17,848 respondents. The researchers classified the data of children aged 0–18 months into those who received the complete polio vaccination (polio vaccines 0, 1, 2, 3, and 4), with a total of 5378 respondents. Children who did not receive a complete vaccination series were not included in the study sample.

2.3. Variables

The independent variables consisted of the mother's age, education level, wealth quintile, residence, number of living children, marital status, whether they had visited a health facility in the last six months, health insurance, whether the mother was currently working and household head gender. The dependent variable was complete polio vaccination coverage among Indonesian children aged 0–18 months. The researchers merged the data from polio vaccinations 0, 1, 2, 3 and 4 to obtain complete polio vaccination coverage. All of the variables, both independent and dependent, are available in the IDHS 2017 (Survey, 2017).

2.4. Instruments

The instrument used in this study was the DHS Questionnaire Phase 7. Polio vaccination information is available under the Women Questionnaire Topics section (Survey, 2015). To minimize the number of errors made when obtaining the desired information and to maximize validity and reliability, the DHS produced policies for the use of the questionnaires, which have been translated and printed in all of the major local languages in which the interviews are expected to take place (ICF International, 2012).

The mother's age was divided into three categories: 15–24 years old, 25–34 years old and 35–49 years old. Age was classified based on the common Indonesian age categories (Health Ministry of Republic Indonesia, 2009). Education level in Indonesia is divided into four categories: higher education, secondary education, primary education, and no education. This division is based on Law No. 20 of 2003 concerning the National Education System in Indonesia (Kementerian Pendidikan dan Kebudayaan, 2003). The wealth quintiles were divided into five categories based on principal component analysis (PCA) (Vyas & Kumaranayake, 2006): poorest, poorer, middle, richer, and richest. The wealth quintiles were measured by the percentage distribution of the de jure population using the wealth quintiles and the Gini coefficient. For the percentage distribution, the numerators were divided by the denominators multiplied by 100. The results were then divided into five equal parts from quintile one (poorest) to quintile five (richest); each included 20% of the total population (Croft, Marshall, & Allen, 2018a; Survey, 2018). The residence variable in this study was categorized into rural and urban. This division is based on The Indonesian Population Census conducted in 2010 (BPS, 2010).

The number of living children variable in this study was categorized into 0–4, 5–9, and 10–14. The determination of the classification of the number of children refers to the IDHS 2017 data, which state that the study sample's number of live children was in the range of 0–14 children (Survey, 2017). The marital status variable was divided into six categories: never, married, partnered, widowed, divorced, and separated. The divisions of this category refer to the IDHS 2017 (Survey, 2017). The variable for visiting health facility in the last six months was determined based on the respondent's most recent visit to a health facility in the last six months. The categories were "yes" and "no" (Croft, Marshall, & Allen, 2018b). The variable of health insurance was divided into two categories, "yes" and "no." The respondents were said to have health insurance if at the time of the interview they said they had health insurance and could show a membership card. If at the time of the interview there were family members who did not have health insurance, the respondent was not included in the category of having health insurance (Survey, 2017). The respondent currently working variable was divided into two categories, "yes" and "no". The currently working variable was determined based on the respondent's employment status at the time of the interview in the IDHS 2017 (Survey, 2017). Household head gender in this study was used to identify the head of the family and thus the decision-maker. The variable was divided into two categories, "male" and "female" (Survey, 2017).

Complete polio vaccination was categorized as either "yes" or "no."

To obtain the complete polio vaccination variable, the researchers merged the data of 0, 1, 2, 3, and 4 polio vaccinations. If the children received the complete polio vaccination series of 0, 1, 2, 3, and 4 polio shots in the age range of 0–18 months, they were categorized as “yes.” If the polio vaccination series was incomplete, it was categorized as “no.” If the child’s age was more than 18 months, the data were excluded from the study (Survey, 2015). The Indonesian government states that polio is one of the mandatory vaccinations that must be given to children aged 0–18 months (Indonesian Pediatric Society, 2017).

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2.5. Data analysis

In this study, the researchers used STATA 16.1 software to conduct the analysis. To conduct the bivariate analysis, we used the chi-square test. To conduct the multivariate analysis, we used binary logistics. Both the independent and dependent variables used an adjusted odds ratio (AOR) with a 95% confidence interval (CI) and a level of significance for the p-value of 0.005.

3. Results

Table 1 shows that complete polio vaccination coverage occurred for 1,915 children aged 0–18 months (35.83%). This is not in accordance with the target of the government, which stated that the polio vaccination is one of the mandatory vaccinations. Most mothers (2798, 52.35%) were aged 25–34 years and had a secondary level of education (3049, 57.04%). For the wealth quintiles, the majority were in the poorest category (1420, 26.57%). The majority of the respondents in this study lived in rural areas (2739, 51.24%). The majority had 1–4 living children (5063, 94.72%). Most of the respondents were married (5121, 95.81%). The majority of respondents had routinely visited health facilities in the past 6 months (3,918, 73.30%), and most also had health insurance (3477, 65.05%). The majority of respondents did not work (3387, 63.37%). With regard to the gender of the household head, most were male (4852, 90.78%).

The results of the bivariate analysis using the chi-square test shown in Table 2 indicate that the majority of variables were associated with complete polio vaccination coverage among Indonesian children aged 0–18 months. However, marital status, health insurance, and household head gender were not related to complete polio vaccination coverage.

Table 3 shows the results of the multivariate analysis conducted using binary logistics. The analysis shows that maternal age, education level, wealth quintile, visits to health facility in the last six months and current employment were associated with complete polio vaccination coverage among Indonesian children aged 0–18 months. Mothers in the 15- to 24-year-old age range were 1.271 times more likely to give their children the complete set of polio vaccinations [AOR = 1.271; 95% CI = 1.066–1.515]. Children of mothers with a secondary education level were 0.704 times less likely to have the complete polio vaccination series [AOR = 0.704; 95% CI = 0.598–0.830]. Children of mothers in the poorer wealth quintile status were 0.727 times less likely to have complete polio vaccination coverage [AOR = 0.727; 95% CI = 0.610–0.867]. Mothers who routinely visited a health facility were 0.875 times less likely to enable complete polio vaccination than those who did not visit a health facility [AOR = 0.875; 95% CI = 0.768–0.997]. Mothers who worked were 0.823 times less likely to enable complete polio vaccination coverage than those who were not working [AOR = 0.823; 95% CI = 0.727–0.931].

4. Discussion

Polio vaccine coverage in Indonesia was 35.83% in 2017. This percentage was slightly smaller than the data from the Ministry of Health of the Republic of Indonesia in 2017 and 2018, which state that

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Table 1
Characteristics of the respondents (n = 5378).

Characteristics	n	%
Complete polio vaccination series		
Yes	1915	35.83
No	3430	64.17
Mother’s age (years)		
35–49	1196	22.38
25–34	2798	52.35
15–24	1351	25.28
Education		
Higher education	1035	19.36
Secondary education	3049	57.04
Primary education	1193	22.32
No education	68	1.27
Wealth quintile		
Poorest	1420	26.57
Poorer	1098	20.54
Middle	984	18.41
Richer	960	17.96
Richest	883	16.52
Residence		
Urban	2606	48.76
Rural	2739	51.24
Number of living children		
9–12	15	0.28
5–8	267	5.00
1–4	5063	94.72
Marital status		
Never	14	0.26
Married	5121	95.81
Partnered	114	2.13
Widowed	20	0.37
Divorced	56	1.05
Separated	20	0.37
Visited a health facility		
No	1427	26.70
Yes	3918	73.30
Insurance		
No	1868	34.95
Yes	3477	65.05
Currently working		
No	3387	63.37
Yes	1958	36.63
Household head		
Male	4852	90.78
Female	493	9.22

the national polio vaccine coverage was 47% and 67.6%, respectively. Indonesia Health Ministry data use children aged 12–23 months and inactivated polio vaccine (IPV) as the sample (Health Ministry of Republic Indonesia, 2018, 2020). In this study, the difference in percentage is due to differences in the age of the sample, the year of the data, and the type of polio vaccine. In this research, the sample was children aged 0–18 months. This is in accordance with Indonesian government regulations that the polio 0 to polio 4 vaccines must be given at the age of 0–18 months.

There were five significant factors associated with polio vaccination coverage in Indonesia: the mother’s age, education level, wealth quintile, recent visit to a health facility, and whether the mother was currently working.

Younger mothers are more likely to vaccinate their children. This result is supported by a previous study (Awasthi, Pandey, Singh, Kumar, & Singh, 2015; Fatir, & Okoro, 2012). Younger mothers use more information sources, such as social media and larger social networks. They may have a better understanding of the importance of vaccination in response to a vaccination-preventable disease or to decrease the impact of a disease (Naeem et al., 2010). This situation may give rise to

Table 2
Bivariate analysis of the coverage and factors associated with complete polio vaccination among Indonesian children aged 0–18 months (n = 5,378).

Variables	Complete Polio Vaccination				X ²	p
	Yes		No			
	n	%	n	%		
Mother's age (years)					6.76**	0.034
35–49	434	8.12	762	14.26		
25–34	1036	19.38	1762	32.97		
15–24	445	8.33	906	16.95		
Education					32.69***	0.000
Higher	365	6.83	670	12.54		
Secondary	1168	21.85	1881	35.19		
Primary	372	6.96	821	15.36		
No	10	0.19	58	1.09		
Wealth quintile					68.43***	0.000
Poorest	388	7.26	1032	19.31		
Poorer	393	7.35	705	13.19		
Middle	403	7.54	581	10.87		
Richer	372	6.96	588	11.00		
Richest	359	6.72	524	9.80		
Residence					21.54***	0.000
Urban	1015	18.99	1591	29.77		
Rural	900	16.84	1839	34.41		
Number of living children					30.15***	0.000
9–12	3	0.06	12	0.22		
5–8	55	1.03	212	3.97		
1–4	1857	34.74	3206	59.98		
Marital status					7.60	0.180
Never	4	0.07	10	0.19		
Married	1853	34.67	3268	61.14		
Partnered	29	0.54	85	1.59		
Widowed	6	0.11	14	0.26		
Divorced	18	0.34	38	0.71		
Separated	5	0.09	15	0.28		
Visited a health facility					8.89***	0.003
No	465	8.70	962	18.00		
Yes	1450	27.13	2468	46.17		
Insurance					0.49	0.483
No	681	12.74	1187	22.21		
Yes	1234	23.09	2243	41.96		
Currently working					8.58***	0.003
No	1164	21.78	2223	41.59		
Yes	751	14.05	1207	22.58		
Household head					1.80	0.179
Male	1752	32.78	3100	58.00		
Female	163	3.05	330	6.17		

*** p < 0.01, ** p < 0.05, * p < 0.1, X2: chi-square.

negative aspects of online information, especially from unofficial sites, such as inaccurate, unsuitable, and biased information (Diviani, van den Putte, Meppelink, & van Weert, 2016). Health workers should validate the information that parents obtain from the internet and from other people.

The mother's education level was also associated with complete polio vaccination. Mothers with a secondary level of education were less likely to have immunized their children. Several previous studies support this result (Arooj et al., 2013; Awasthi et al., 2015; Rammohan & Awofeso, 2015). Educated mothers are better at using the knowledge provided by health workers and others (Vikram, Vanneman, & Desai, 2012). Educated mothers are more aware of health issues, have better knowledge, and have wider social contacts. These conditions make them more confident and active in regard to making the decision to vaccinate their children. Educated mothers translate their knowledge into health actions such as vaccinating their children.

Poorer wealth quintile households are less likely to vaccinate their

Table 3
Multivariate analysis of the coverage and factors associated with complete polio vaccination among Indonesian children aged 0–18 months (n = 5378).

Variables	AOR	P	95% CI	
			Lower	Upper
Mother's age (years)				
35–49	1.000			
25–34	1.054	0.490	0.908	1.223
15–24	1.271***	0.008	1.066	1.515
Highest educational level				
Higher	1.000			
Secondary	0.704***	0.000	0.598	0.830
Primary	0.835*	0.084	0.681	1.025
No	1.694	0.142	0.838	3.422
Wealth quintile				
Poorest	1.000			
Poorer	0.727***	0.000	0.610	0.867
Middle	0.610***	0.000	0.506	0.734
Richer	0.682***	0.000	0.560	0.831
Richest	0.611***	0.000	0.492	0.759
Residence				
Urban	1.000			
Rural	1.050	0.457	0.923	1.195
Number of living children				
10–14	1.000			
5–9	0.998	0.998	0.266	3.738
0–4	0.483	0.271	0.133	1.762
Visited a health facility				
No	1.000			
Yes	0.875**	0.046	0.768	0.997
Currently working				
No	1.000			
Yes	0.823***	0.002	0.727	0.931

*** p < 0.01, ** p < 0.05, * p < 0.1, X2: Chi-square, AOR: Adjusted Odds Ratio, CI: Confident Interval; Goodness of fit: 2245.87.

children. The upper wealth quintiles, which are related to employed or working parents, are less likely to vaccinate their children. All wealth quintiles can obtain the basic vaccination free of cost. This study found that respondents who routinely visited a local health facility, such as a primary care center, in the past six months were less likely to vaccinate against polio. In this case, the likelihood of obtaining the polio vaccination may be due to demographic, cultural, and trustworthiness factors among the population in Indonesia (McRae, 2018; Rochmyaningsih, 2018). Demographically, the distance between the respondent's home and the health facility location may make the vaccination unaffordable. Furthermore, culture and beliefs may prohibit vaccination (Heriyanto, Susanti, & Setiawaty, 2018). This issue requires more attention from both the local government and health workers. However, the results of this study show that regular visits to local health facilities are related to high compliance with administering vaccinations.

Respondents who are employed tend to not give the polio vaccinations to their children. The results of this study are supported by other studies that state that when there is a high level of work on the part of the parents, the opportunity to vaccinate children may be missed (English et al., 2020; Weiss, Winch, & Burnham, 2009a). In this regard, it is important for parents to know that the provision of vaccinations has become mandatory according to the government. Thus, parents are expected to give up their free time or to interrupt their work to provide vaccinations for their children. The role of health workers is also important in providing a proper understanding of the administration of the polio vaccinations (Khan, Ahmad, Aqeel, Akbar, et al., 2015).

There was no significant association between residence and vaccination coverage. This finding is similar to those of previous studies (Cao et al., 2018; Kusananto, Arifin, & Kurniawati, 2020). The distribution of

the locations of health care facilities makes the vaccination easy to access. Children can receive all of their basic vaccinations in school as part of a mass program in addition to accessing them at primary care centers, hospitals and other health care facilities (Indonesian Health Ministry, 2017).

In this study, the number of children was not related to coverage of the polio vaccination. The respondents may have lacked knowledge and not provided the polio vaccination to their children, or they may have had a good level of knowledge of the importance of giving the polio vaccination to their children. Regardless of the number of children in a family, the respondents continued to provide the necessary vaccinations (Khan, Ahmad, Aqeel, Salman, et al., 2015; Mirani, Holakouie-Naieni, Majdzadeh, Nematollahi, & Baig, 2017; Weiss et al., 2009b). The results of other studies note that respondents with a large number of children and those in locations far from where the vaccinations are given do not give vaccinations to their children. This could be due to economic factors in the family (Arooj et al., 2013; Zimmermann, Hagedorn, & Lyons, 2019).

5. Limitations

This study was limited to children aged 0–18 months, which is the age required for children to obtain the complete series of polio vaccinations. However, further research is needed to examine children in Indonesia under five years old to determine the full extent of the coverage of the polio vaccination.

6. Conclusion

Mothers in the early adult age category are more likely to obtain the polio vaccination for their children. This is because mothers in this age range can receive information well and have an understanding of the importance of the polio vaccination. In addition, education level can affect mothers' knowledge in relation to providing the polio vaccination to their children. The wealth quintile and occupational status of the respondent are also important factors that need to be considered by the government in relation to community verification to achieve a positive polio vaccination status. Regular visits to the nearest health facility allow health workers to provide information to mothers regarding the importance of the polio vaccination for their children's health. To achieve the target of polio vaccination coverage, the government of Indonesia needs to pay attention to the factors that can be improved and developed in addition to reviewing the policies that have been implemented so far. Promotive efforts need to be made in addition to further research.

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Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Supplementary material

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.chidyouth.2020.105399>.

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