Scientific Foundation SPIROSKI, Skopje, Republic of Macedonia
Open Access Macedonian Journal of Medical Sciences. 2022 Feb 16; 10(E):264-268.
https://doi.org/10.3889/oamjms.2022.8500
eISSN: 1857-9655
Category: *E - Public Health*
Section: *Public Health Disease Control*

Association between Maternal Health Care and Basic Immunization Completeness in Children Aged 12–23 Months: Analysis of 2017 Indonesian Demographic and Health Survey

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Edited by: Ksenija Bogoeva-Kostovska
Citation: Faradita I, Sitaresmi MN, Wahab A. Association between Maternal Health Care and Basic Immunization Completeness in Children Aged 12–23 Months: Analysis of 2017 Indonesian Demographic and Health Survey. Open Access Maced J Med Sci. 2022 Feb 16; 10(E):264-268. https://doi.org/10.3889/oamjms.2022.8500
Keywords: Children; Immunization; Maternal health care; Demographic health survey
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Received: 05-Jan-2022
Revised: 31-Jan-2022
Accepted: 06-Feb-2022

Funding: This research did not receive any financial support
Competing Interests: The authors have declared that no competing interests exist

Abstract

BACKGROUND: The coverage of complete basic immunization in Indonesia is still lower than the target stated in the 2015-2019 Ministry of Health Strategic Plan. It may be caused by several factors, one of the essential factors is maternal health services.

AIM: The study aims to assess the association between maternal health services and immunization completeness in Indonesian children aged 12–23 months.

METHODS: A cross-sectional design was conducted using the 2017 Indonesian Demographic Health Survey. Two-stage stratified random sampling was used to obtain representative samples from all provinces in Indonesia. The subjects of this study were mothers who had children aged 12–23 months. A total of 3,398 samples were obtained after considering the inclusion and exclusion criteria. The data were analyzed using chi-square and logistic regression.

RESULTS: The prevalence of complete immunization of Indonesian children aged 12–23 months was 61.4%. From multivariate analysis, we found that mothers who attend more than four antenatal care (ANC) (Adjusted odds ratio [AOR] 3.23 95% Confidence interval [CI] [2.31–4.52]), delivery by health-professionals (AOR 3.32 95%CI [2.26–4.88]), and attended postnatal care (PNC) (AOR 1.31 95% CI [1.07–1.59]) were predictors of complete child immunization. In addition, children whose mothers had a higher educational level and who live in Java-Bali were more likely to be completely vaccinated.

CONCLUSION: Maternal health services, which consist of ANC services, delivery by health workers, and PNC services, were associated with the completeness of basic immunization in Indonesian children aged 12–23 months. Strategies to improve immunization coverage must be carried out by increasing the continuity of maternal health services since pregnancy, childbirth, and postpartum.

Introduction

Immunization is the most cost-effective health intervention program because it can prevent and reduce morbidity, disability, and mortality due to vaccine-preventable diseases. Recently, vaccination can prevent more than 20 life-threatening diseases. It is estimated that 2– million deaths can be prevented from diseases such as diphtheria, tetanus, pertussis (DTP), influenza, and measles every year [1]. However, despite the success story of vaccination, globally, the immunization coverage for children has decreased from 86% in 2019 to 83% in 2020, increasing 3.4 million children who do not receive immunization. It was estimated that 23 million children under 1 year of age do not receive basic immunization consisting of 17.1 million infants who did not receive the initial dose of the Diphtheria, Pertussis, Tetanus vaccine and 5.6 million children who received only partial vaccination. It indicates a lack of access to immunization and other health services [2].

According to the 2017 health report from the Ministry of Health (MoH), Republic Indonesia, complete basic immunization coverage for children aged 12–23 months has only reached 65% [3]. This coverage failed to achieve the strategic plan target of 93%, even decreased compared to the 2012 Indonesian Demographic Health Survey (IDHS) results. Children aged 12–23 months who did not receive immunizations even increased from 2013 (8.7%) to (9.2%) in 2018 [4].

Strategies to increase the provision of complete immunization must be carried out by increasing the continuity of maternal health services since pregnancy, childbirth, and postpartum [5]. Continuity of maternal health services is one of the critical factors for increasing child immunization. Mothers who receive three health services, namely antenatal care (ANC), birth attendants by health workers, and postnatal care (PNC), have a higher probability of providing complete basic immunizations [6].

The coverage of pregnant women in Indonesia who received the minimal 4 times ANC (K4) was

77%. Delivery assisted by health workers was 91%, and coverage of PNC visits reached 87% in 2017 but decreased to 85% in the following year [3]. There were still significant disparities among provinces and districts regarding maternal health services in the Indonesia [4]. Research correlating the completeness of children's basic immunization with maternal health services focused on three main variables: ANC services, birth attendants, and PNC services in Indonesia, is still limited. The study aims to assess the correlations between maternal health services and complete basic immunization in Indonesian children aged 12–23 months.

Methods

We conducted a cross-sectional study using data from the 2017 IDHS. This research took place from 24 July to 30 September 2017. The 2017 IDHS successfully interviewed 49,627 eligible women aged 15–49 years. The sample frame of the 2017 IDHS is the Master Sample of Census Blocks from the 2010 Population Census. Two-stage stratified sampling, which covered 1,970 census blocks in urban and rural areas, was used to obtain representative samples from all provinces in Indonesia. In the first stage, several census blocks were selected with systematic sampling proportional to size, where size is the number of households listed in the 2010 Population Census. In the second stage, 25 census blocks representing the number of provinces in Indonesia were selected. Eight families were randomly selected for each selected census block [7].

The outcome of this study was the completeness of children's basic immunizations. Immunization was considered to be complete if the child had received one dose of hepatitis B vaccines, one dose of *Bacilli Calmette Guerin* (BCG), 3 doses of combination vaccines of DTP, and Hepatitis B, 4 doses of polio, and one dose of measles, according to the immunization national guideline. The sources of information on the immunization status of children were obtained from the vaccination card and report by the mother. The independent variable in this study is maternal health services by focusing on three main variables, namely ANC services, birth attendants, and PNC services. We included children aged 12–23 months, who had complete data on basic immunization completeness, and maternal health services: ANC services, birth attendants, and PNC services, which amounted to 3,398. Furthermore, the results were analyzed using the chi-square test and logistic regression to determine the variables that affect the child immunization completeness. Ethical approval was obtained from the Ethical Committee of Faculty of Medicine, Public Health and Nursing, Universitas Gadjah Mada, no KE/FK/1170/EC/2021.

Results

Table 1 presents the distribution of the characteristics of respondents. Of the 3,398 samples, 61.4% had a complete primary immunization. The mean children aged was 17.3 and 50.7% were male. Most (91.1%) mothers had more than four ANC visits, the majority (92.9%) of mothers delivered by health workers, and 69.1% attended PNC. The bivariate analysis in Table 2 presents the significant variables with the completeness of basic immunization: ANC, birth attendants, PNC services, birth order, father's education, mother's education, geographic area, and wealth index. Meanwhile, the mother's occupation, age, and residence were not significantly related to the completeness of immunization.

Table 1: Characteristics of respondents

Variable (n = 3,398)	Total	
	n	(%)
Child aged: mean(± SD), years	17.3	(3.42)
Immunization status		
Completed	2086	(61.4)
Un-completed	1312	(38.6)
Antenatal care (frequency)		
<4	301	(8.9)
4–8	1310	(38.5)
8+	1787	(52.6)
Birth attendant		
Non-health professional	243	(7.1)
Health professional	3155	(92.9)
Postnatal care		
No received	1050	(30.9)
Received	2348	(69.1)
Birth order		
1	1131	(33.3)
2–3	1835	(54.0)
≥4	432	(12.7)
Child gender		
Male	1723	(50.7)
Female	1675	(49.3)
Father education level		
Primary (<9 years)	978	(28.8)
Secondary (9–12 years)	1961	(57.7)
Higher (>12 years)	459	(13.5)
Mother education		
Primary (<9 years)	832	(24.5)
Secondary (9–12 years)	2006	(59.0)
Higher (>12 years)	560	(16.5)
Mother occupation		
Working	1386	(40.8)
Not working	2012	(59.2)
Mother age (years)		
<25	747	(21.9)
25–34	1749	(51.5)
≥35	902	(26.6)
Residence		
Rural	1739	(51.2)
Urban	1659	(48.8)
Geographic region		
Maluku-Papua	106	(3.1)
Java-Bali	1947	(57.3)
Sumatera	746	(22.0)
Kalimantan Sulawesi	435	(12.8)
NTT-NTB	164	(4.8)
Wealth index		
Poorest	675	(19.9)
Poorer	685	(20.2)
Middle	654	(19.2)
Richer	725	(21.3)
Richest	659	(19.4)

Multivariate analysis using logistic regression found that the correlation between maternal health services and immunization completeness still shows a significant value after controlling for other variables. Mothers who received ANC services more than 8 times during delivery had a 3.52 times greater chance of providing basic immunization to their children than

Table 2: Association of maternal healthcare and children immunization completeness in Indonesia

Variable (n = 3,398)	Immunization status				OR	(95%CI)	p-value
	Un-completed (n = 1,312)		Completed (n = 2,086)				
	n	(%)	n	(%)			
Antenatal care (frequency)							
<4	222	(16.9)	78	(3.7)	Ref	Ref	Ref
4–8	499	(38.0)	811	(38.9)	4.57	(3.32–6.29)	0.000
8+	591	(45.1)	1197	(57.4)	5.70	(4.16–7.82)	0.000
Birth attendant							
Non-health professional	181	(13.8)	62	(3.0)	Ref	Ref	Ref
Health professional	1131	(86.2)	2024	(97.0)	5.17	(3.66–7.29)	0.000
Postnatal care							
No received	482	(36.7)	568	(27.2)	Ref	Ref	Ref
Received	830	(63.3)	1518	(72.8)	1.55	(1.29–1.86)	0.000
Birth order							
≥4	219	(16.7)	213	(10.2)	Ref	Ref	Ref
1	429	(32.7)	702	(33.7)	1.64	(1.29–2.21)	0.000
2–3	664	(50.6)	1171	(56.1)	1.82	(1.42–2.33)	0.000
Child gender							
Male	648	(49.4)	1028	(49.3)	Ref	Ref	Ref
Female	664	(50.6)	1058	(50.7)	1.00	(0.84–1.19)	0.941
Father education level							
Primary (<9 years)	468	(35.7)	511	(24.5)	Ref	Ref	Ref
Secondary (9–12 years)	701	(53.4)	1260	(60.4)	1.64	(1.35–2.00)	0.000
Higher (>12 years)	143	(10.9)	315	(15.1)	2.01	(1.52–2.66)	0.000
Mother education level							
Primary (<9 years)	416	(31.7)	417	(20.0)	Ref	Ref	Ref
Secondary (9–12 years)	718	(54.7)	1288	(61.7)	1.79	(1.45–2.20)	0.000
Higher (>2 years)	178	(13.6)	381	(18.3)	2.12	(1.62–2.78)	0.000
Mother occupation							
Working	535	(40.8)	851	(40.8)	Ref	Ref	Ref
Not working	777	(59.2)	1235	(59.2)	1.00	(0.84–1.19)	0.994
Mother age (years)							
<25	304	(23.2)	443	(21.2)	Ref	Ref	Ref
25–34	636	(48.4)	1114	(53.4)	1.19	(0.94–1.51)	0.135
≥35	372	(28.4)	529	(25.4)	0.98	(0.75–1.28)	0.890
Residence							
Rural	706	(53.8)	1033	(49.5)	Ref	Ref	Ref
Urban	606	(46.2)	1053	(50.5)	1.18	(0.91–1.33)	0.053
Geographic region							
Maluku-Papua	58	(4.4)	49	(2.4)	Ref	Ref	Ref
Java-Bali	692	(52.7)	1255	(60.1)	3.24	(2.16–4.85)	0.000
Sumatera	361	(27.5)	385	(18.5)	2.11	(1.52–2.93)	0.000
Kalimantan Sulawesi	158	(12.1)	276	(13.2)	2.03	(1.44–2.86)	0.000
NTT-NTB	43	(3.3)	121	(5.8)	1.24	(0.89–1.74)	0.198
Wealth index							
Poorest	336	(25.6)	340	(16.3)	Ref	Ref	Ref
Poorer	284	(21.6)	402	(19.3)	1.40	(1.08–1.82)	0.010
Middle	235	(17.9)	419	(20.1)	1.76	(1.35–2.29)	0.000
Richer	244	(18.6)	480	(23.1)	1.94	(1.49–2.52)	0.000
Richest	213	(16.3)	445	(21.2)	2.06	(1.57–2.71)	0.000

OR: Odds ratio, CI: Confidence interval, Ref: Reference.

mothers who only visited ANC <4. Mothers whose births were assisted by health workers had a 3.32 times chance to provide complete basic immunizations. Mothers who received PNC services after delivery increased the provision of complete basic immunization to children with an Odds ratio (OR) value of 1.31 (1.07–1.59). Children with a birth order of 2–3 have a 1.37 (1.04–0.80) greater chance of getting immunized than the first child, which is statistically significant. Mothers with higher education levels significantly increased the provision of basic immunization to children with an OR value of 1.64 (1.22–2.20). Respondents living in the Java-Bali area have a 2.61 higher chance of getting complete basic immunization than respondents who live in the Maluku-Papua area (Table 3).

Table 3: Analysis multivariate: Association of maternal healthcare and children immunization completeness in Indonesia

Variable	Immunization Status		
	AOR	95% CI	p-value
Antenatal care (frequency)			
<4	Ref	Ref	Ref
4–8	3.23	(2.31–4.52)	0.000
>8	3.52	(2.49–4.97)	0.000
Birth Attendant			
Non-health professional	Ref	Ref	Ref
Health professional	3.32	(2.26–4.88)	0.000
Postnatal care			
No received	Ref	Ref	Ref
Received	1.31	(1.07–1.59)	0.008
Birth order			
≥4	Ref	Ref	Ref
1	1.11	(0.82–1.49)	0.493
2–3	1.37	(1.04–1.80)	0.024
Mother education*			
Primary (<9 years)	Ref	Ref	Ref
Secondary (9–12 years)	1.50	(1.19–1.88)	0.000
Higher (>12 years)	1.64	(1.22–2.20)	0.001
Geographic region			
Maluku-Papua	Ref	Ref	Ref
Java-Bali	2.61	(1.72–3.97)	0.000
Sumatera	1.23	(0.87–1.73)	0.224
Kalimantan-Sulawesi	1.42	(1.00–2.02)	0.049
NTT-NTB	0.84	(0.59–1.18)	0.325

CI: Confidence interval, Ref: Reference, AOR: Adjusted odds ratio.

Discussion

Using the national representative data, we found that the coverage of complete basic immunization among Indonesian children aged 12–23 months in 2017 was 61, 4%, still below the target of the Indonesian MoH strategic planning of 90% coverage [8]. This 2017 child immunization coverage is almost the same as the 2013 coverage reported by Holipah *et al*. (2018), which used the 2013 Indonesian National Socioeconomic [9].

Identifying how maternal health services and other determinants of children immunization is essential to improve the coverage of children's immunization in Indonesia.

This research found a relationship between maternal health services and the children's basic immunization completeness. In line with the study conducted in 29 countries in sub-Saharan Africa, mothers who use maternal health services (ANC visits, delivery by health workers, and PNC visits) have a higher chance of providing complete immunization to their children. Frequent contact with health services provides an opportunity for mothers to obtain accurate information about health care and makes mothers aware of the importance of immunization for their children [10].

In line with research conducted by India, we also found that mothers whose births were assisted by health professionals were proven to increase the provision of complete immunization significantly [11]. Based on the expended program immunization recommendations, health workers must provide hepatitis B immunization to all newborns within 24 h of birth. Therefore, newborns can receive immunizations immediately after birth if health workers carry out birth attendants, and mothers can obtain adequate information from health workers about the correct immunization sequence [9].

This study showed that mothers who received PNC services after delivery had a 1.31 times greater chance of giving complete immunizations to their children. This finding confirmed the result of a previous study in 12 East Africa countries that also used demographics and health that found mothers who had PNC visits had a 1.34 times higher chance of fully vaccinating their children than mothers who did not have PNC visits [12]. PNC visits provide an opportunity for health workers to administer BCG, and polio vaccinations thereby increasing adherence to the immunization program and creating opportunities to start vaccinating children who are not immunized [13].

Similar to a study conducted in urban slums of Western Maharashtra, India, we found that higher education level was found to have a significant relationship with the complete basic provision for children with an OR value of 1.64 [14]. This may be because mothers with higher education have better knowledge, awareness, health-seeking behavior, and decision-making capacity than mothers with lower education. Education can provide a greater understanding of health services and the ability to respond to new knowledge more quickly. Educated mothers may be more aware of the importance of immunization and choose health care services that result in better health status for their children [15]. Nescience and lack of awareness of parents about immunization make children miss the proper immunizations, which in turn increases the likelihood of malnutrition, child mortality, and morbidity [16].

Reviewed from the aspect of the geographical area, it was found that children living in the Java-Bali region had a 2.61 higher chance of getting complete basic immunization than children living in the Maluku and Papua regions. This can be explained by the fact that the geographical differences in each region in Indonesia will affect the level of basic immunization. Remote areas will find it difficult to access the health [17]. Regional differences are associated with a lack of strengthening of the health care system that contributes to immunization failures caused by differences in vaccine supply, availability of health care providers, poorly regulated immunization services or appointments, lack of tracking systems for child absenteeism, poor counseling services. And access to the health facilities [15].

Using a cross-sectional study is the limitation of the study. Therefore, the results only support an association between determinant variables and child immunization completeness, not causality. Another limitation is the study used the 2017 IDHS. Our study aimed to assess the correlations between maternal health services and complete basic immunization in Indonesian children aged 12-23 months. The latest National data that provides individual data both on maternal care (ANC, birth attendants by health workers, and PNC) and child immunization is the 2017 IDHS. IDHS is conducted every 5 years, and the result of the 2021 IDHS has not been published. Indonesian MoH annually reports the health data, but it is aggregate data, not individual data. For the comparison, based on the 2020 Indonesian MoH annually reports, there is a slightly increased coverage of the ANC (1.2%), birth attendance by health care providers (5.0%), and PNC (2.5%) as well as child immunization (2.5%) from 2017 to 2019 (before the COVID-19 Pandemic). In 2020, due to COVID-19 Pandemic, the coverage decreases 2.7% (ANC), 10.6% (PNC), and 8.5% (child immunization) [18]. Another data from the Indonesian Statistic Agency also reported a similar finding, a slightly comparable increase of birth attendance by health providers (1.46%) [19] and complete child immunization (5.1%) [20]. From those data, we can assume that our study still represents the recent Indonesian condition. However, despite this limitation, using a nationally representative sample from a population-based survey that covers every district in Indonesia is the strength of this study.

Conclusion and Recommendation

Maternal health services, which consist of ANC services during pregnancy, delivery by health workers, and PNC services, were associated with the completeness of basic immunization in children

aged 12–23 months in Indonesia. The utilization of maternal health services since pregnancy, childbirth, and postpartum is essential to increase complete basic immunization coverage. It is necessary to provide counseling to increase knowledge, attitudes, and behavior of pregnant women on the importance of utilizing sustainable maternal health services.

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