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ORIGINAL ARTICLE

SOCIODEMOGRAPHIC AND HEALTHCARE FACTORS AS DETERMINANTS OF CHILDHOOD BASIC IMMUNIZATION INCOMPLETION IN PAPUA

Faktor Sosiodemografi dan Layanan Kesehatan sebagai Determinan Ketidaklengkapan Imunisasi Dasar Anak di Provinsi Papua

Ika Puspita Asturiningtyas[1], Sri Nuryani Wahyuningrum[2]
[1]Magelang Unit for Health Research and Development, Central Java, Magelang, Indonesia, 56553, ikapuspita8845@yahoo.com
[2]Magelang Unit for Health Research and Development, Central Java, Magelang, Indonesia, 56553, sn.wahyuningrum@gmail.com
Corresponding Author: Ika Puspita Asturiningtyas, ikapuspita8845@yahoo.com, Magelang Unit for Health Research and Development, Magelang, Central Java, 56553, Indonesia

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ABSTRACT

Background: The morbidity and mortality rate for children under five in Indonesia is high in eastern Indonesia. Incomplete coverage of basic immunization for children under five can increase the risk of Vaccine-Preventable Diseases (VPD). As a province in eastern Indonesia, the coverage of complete basic immunization in Papua is low. **Purpose:** This study aimed to identify sociodemographic and healthcare factors among children who default to complete basic immunizations in Papua. **Methods:** This study utilized data from the 2018 Indonesian National Basic Health Research (Riskesdas). The sample was children aged 12-35 months who live in the Census Blocks (BS) of Riskesdas 2018 in Papua Province and selected to be the sample of Riskesdas 2018. Totally 453 children were included. Bivariate analysis of the data was using Chi-Square test and multivariate with logistic regression. **Results:** The result showed that the prevalence rate for defaulting basic immunization was 71.74%. Sociodemographic factors that increased incomplete basic immunization were poor economic families (OR=1.97; 95% CI=1.10-3.56) and low maternal education (OR=2.00; 95%CI=1.09-3.65). Meanwhile, healthcare factors like no immunization card (OR=6.82; 95%CI=2.65-17.56) and not being born in a healthcare facility (OR=6.05; 95%CI=3.14-11.66) become the strongest factors that increase the risk of incomplete basic immunization. **Conclusion:** This study indicates that sociodemographic and healthcare factors could increase the risk of incomplete basic immunization in Papua. It is important to actively improve healthcare services and educate people about the importance of immunization to reduce the risk of incomplete basic immunization for children in Papua.

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ABSTRAK

Latar Belakang: *Angka kesakitan dan kematian balita di Indonesia cukup tinggi pada wilayah Indonesia timur. Ketidaklengkapan cakupan imunisasi dasar pada balita di suatu wilayah dapat meningkatkan masalah Penyakit yang Dapat Dicegah Dengan Imunisasi (PD3I). Sebagai provinsi di wilayah timur Indonesia, cakupan imunisasi dasar lengkap di Provinsi Papua juga masih sangat rendah.* ***Tujuan:*** *Tujuan penelitian ini adalah untuk mengidentifikasi karakteristik sosiodemografi dan layanan kesehatan pada anak yang gagal memperoleh imunisasi dasar secara lengkap.* ***Metode:*** *Penelitian ini menggunakan data Riset Kesehatan Dasar (Riskesdas) 2018. Sampel merupakan anak usia 12-35 bulan, tinggal di Blok Sensus (BS) Riskesdas 2018 di provinsi Papua, dan terpilih sebagai sampel Riskesdas 2018. Sebanyak 453 anak memenuhi kriteria penelitian ini. Data dianalisis secara bivariat menggunakan uji Chi-Square dan multivariat dengan regresi logistik.* ***Hasil:*** *Hasil penelitian menunjukkan bahwa sebanyak 71,74% anak tidak mendapatkan imunisasi dasar lengkap. Faktor sosiodemografi yang meningkatkan risiko ketidaklengkapan imunisasi dasar adalah keluarga dengan status ekonomi miskin (OR=1,97; 95%CI=1,10-3,56) dan pendidikan ibu yang rendah (OR=2,00; 95%CI=1,09-3,65). Sementara itu, faktor layanan kesehatan seperti ketiadaan kartu catatan imunisasi (OR=6,82; 95%CI=2,65-17,56) dan tempat persalinan bukan di fasilitas kesehatan (OR=6,05; 95%CI=3,14-11,66) menjadi faktor utama yang meningkatkan risiko ketidaklengkapan imunisasi dasar pada anak.* ***Kesimpulan:*** *Hasil penelitian ini menunjukkan bahwa baik faktor sosiodemografi maupun layanan kesehatan meningkatkan risiko ketidaklengkapan imunisasi dasar di Provinsi Papua. Peningkatan layanan kesehatan secara aktif dan edukasi ke masyarakat penting dilakukan untuk menurunkan risiko ketidaklengkapan imunisasi dasar pada anak di Provinsi Papua.*

INTRODUCTION

Morbidity and mortality in infants and children under five years (toddlers) is a major global problem. In 2020, there were 5 million mortalities among children under five, or around 138,000 mortality every day. Most of them were caused by diseases that can be prevented and treated, apart from prematurity or complications during pregnancy (1). In Indonesia, 1 in 30 children dies before reaching the age of five, with a rate of 1 in 10 in several districts in Eastern Indonesia - the most underdeveloped region in the country. Pneumonia, congenital diseases, and diarrhea are the leading causes of death among children under five in Indonesia, accounting for 36%, 13%, and 10% of all causes of under-five mortality, respectively, as well as neonatal complications, injuries, measles, and malaria in endemic areas (2).

Most of under-five mortality is attributable to diseases that can be prevented by immunization, commonly called Vaccine-Preventable Diseases (VPD). Children in the 12-35 age group, usually called toddlers, still have weak immunity. Research conducted in Jambi City, Indonesia, showed that the highest proportion of pneumonia cases was observed in toddlers between the age of 12 and 35 months (75.76%). The completeness of immunization status influenced toddlers' immunity to diseases (3).

Immunization is the most efficient and cost-effective intervention to reduce childhood morbidity and mortality. Children's immunization has prevented 2-3 million childhood mortality per year (4). Most childhood mortality by Vaccine-Preventable Disease was common in low- and middle-income countries. In countries with a high number of VPD, immunization coverage is important to be achieved to build childhood immunity. The modeling conducted in low-middle-income countries estimates that from 2,000-2,030 about 120 million childhood mortality could be prevented by immunization, 58 million of them from measles vaccination and 38 million from hepatitis B vaccination. Increasing

vaccination coverage and adding new vaccines will reduce deaths by 72% (5).

National Basic Health Research Indonesia (Riskesdas) data shows that complete immunization coverage for children aged 12-23 in Indonesia from 2007 (41.60%), 2010 (53.80%), 2013 (59.20%), and 2018 (59.70%) is still low. Likewise, the follow-up immunization coverage was only 39.40% in 2018 (6). Papua as a province in eastern Indonesia was the lowest province in achieving complete basic immunization coverage. Riskesdas data in 2018 show that complete basic immunization coverage in Papua ranks the second lowest (29.20%) (6).

Previous studies have revealed that sociodemographic characteristics were associated with incomplete basic immunization in children under five. Sociodemographic factors such as parental age, parental education, parental occupation, number of children in the family, family economic status, and area of residence also increase the risk of incomplete immunization in children. Apart from sociodemographic factors, healthcare factors are also associated with the failure of children under five to get complete basic immunization. Healthcare factors like antenatal care during pregnancy and birth attendants are also associated with incomplete basic immunization status for children under five (7–9).

The results of the 2013 Riskesdas data analysis also showed that children who did not have an immunization card and were born in a non-health facility had a high risk of experiencing immunization failure (10). The presence of professional health workers, an increase in the number of hospitals, village health posts, and health workers is also positively related to complete basic immunization in children (11). This study, therefore, assesses the sociodemographic and healthcare factors related to the incomplete basic immunization in children in Papua.

METHODS

This cross-sectional study used secondary data from the 2018 National Basic Health Research Indonesia (Riskesdas). The sample criteria for this study were the households with children aged 12-35 months living in the Census Blocks (BS) of Riskesdas 2018 in Papua Province. They were selected to be the sample of Riskesdas 2018. We limited our subjects to children aged 12-35 months as it is expected that children have completed all the basic doses of immunizations. Given the low coverage of immunization coverage in Papua province, there may be some delay in the immunization time. So, this study wanted to see the factors influencing incomplete basic immunization in children up to 35 months of age to accommodate the untimeliness of basic immunization. Riskesdas 2018 has received ethical approval from the Health Research Ethics Committee, Health Research and Development Agency Number: LB.02.01/2/KE.024/2018.

Variables collected in this study included immunization status, sociodemographic characteristics, and health services factors. Data were collected through interviews by the enumerator. Data on immunization were collected through the vaccination cards or verbal reports. The enumerators asked mothers to present the vaccination cards or other children's health books to collect vaccination dates. In the absence of vaccination cards, mothers were asked to recall the vaccination administered to their children. If one stated that the child had been immunized, it was concluded that the child had been immunized.

The outcome variables were the completeness of basic dose of immunization. The children were categorized as the complete immunized if they received basic immunization, including Hepatitis B (HB-0), BCG, DPT-HB/DPT-HB-Hib (3 doses), Polio 1-4 or IPV 1-3, and measles. And those who were not vaccinated or received less than the standard of basic dose of immunization were defined as incomplete immunization.

The independent variables include sociodemographic and healthcare factors. Sociodemographic characteristics include children's age and sex, parent's age, parent's education, parent's occupation, family size, the number of children under five, economic status, and residence. Healthcare factors include pregnancy care labor, place of delivery, immunization card, transportation to health facilities, travel time, and costs to health facilities. The variables obtained from the data management team were then categorized.

Riskesdas 2018 used a complex sampling design by stratification, so we need to consider the weight in the data analysis. We conducted a univariate analysis to get an overview of the frequency distribution. The bivariate analysis used a Chi-square test. For multivariate analysis, logistic regression was used to investigate factors associated with incomplete basic immunization. Variables included in the multivariate were

variables that had a p-value of <0.25 in the bivariate analysis. The level of significance was set at a p-value of less than 0.05 and a 95 % confidence interval (CI).

RESULTS

A total of 453 children met the subject criteria for this study. Figure 1 shows that most children did not get complete basic immunization (71.74%). The coverage for each vaccine is still low. The lowest coverage is vaccines that require replication, like DPT-HB/DPT-HB-HiB (39.74%) and polio (35.54%). Coverage of other vaccines is 44.59% for Hepatitis B, 58.72% for BCG, and 60.26% for measles.

Table 1 summarizes sociodemographic characteristics and the results of the Chi-square test. The majority of the subjects were 12-23 months (56.07%), female (51.66%), mother's age was >25 years old (74.61%), and father's age was >30 years old (67.77%). The mother's and father's education backgrounds were secondary-high education (51.88% and 61.81%). The majority of parents were working, 56.73% for mothers and 94.04% for fathers. There were less than five people (71.52%) and only one child under five (76.16%) in a household. Most of them were in the middle-high economic status (58.94%) and live-in rural areas (71.97%).

Table 1 also shows that most of the pregnancy care laborers were health workers (73.29%), but most of them did not birth in health facility (50.99%). Most of the children had immunization cards (68.43%). Most of them were difficult to reach healthcare facility that provide immunization services (54.75%). The travel time to the healthcare facility is 23 minutes (60.27%) with the cost Rp14.000 (66.01%).

The results of the Chi-square test in Table 1 show that ten variables significantly correlated to incomplete basic immunization in the bivariate analysis. Sociodemographic factors that significantly correlated with incomplete basic immunization were low maternal education (OR=6.42 95%CI=3.91-10.54), low paternal education (OR=3.42; 95%CI=1.99-5.25), unemployed mother (OR=0.46; 95%CI=0.30-0.69), middle-high economic status (OR=3.80; 95%CI=2.35-6.16), and live-in rural area (OR=5.38; 95%CI=3.44-8.43). Meanwhile, healthcare factors that significantly correlated with incomplete basic immunization were non-healthcare workers of pregnancy care labor (OR=9.34; 95%CI=4.22-20.69), not born in a healthcare facility (OR=14.93; 95%CI=8.31-26.82), no immunization card (OR=18.01; 95%CI=7.17-45.23), difficult to reach healthcare facilities (OR=3.99; 95%CI=1.14-13.97), and travel time to the health facilities ≤23 minutes (OR=3.09; 95%CI=1.89-5.04).

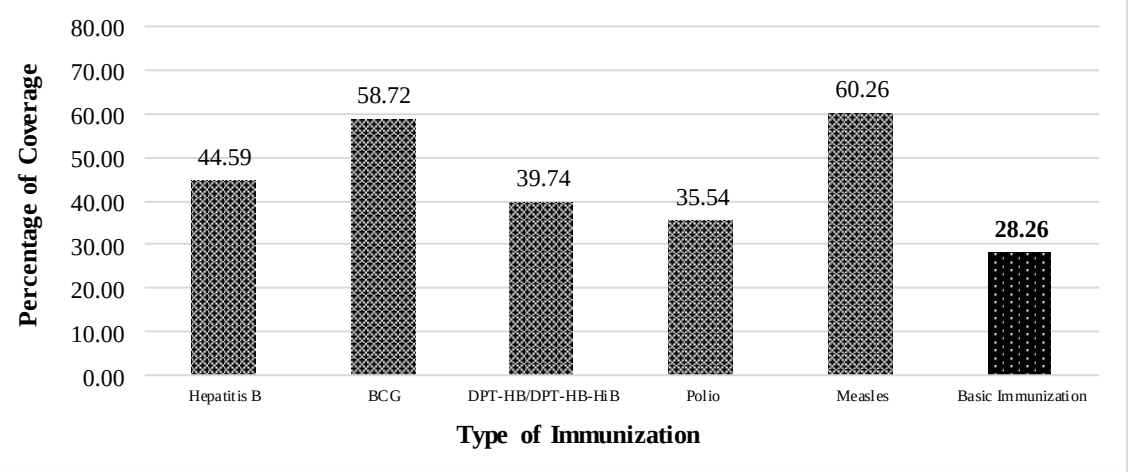

Figure 1. Basic Immunization Coverage per Type of Immunization

Table 1
Distribution of Respondent and Chi Square Test for Basic Immunization Status by Sociodemographic and Health Care Factors

Variables	Basic Immunization Status n (%)		Total n (%)	p-value	OR (95%CI)
	Incomplete	Complete			
Sociodemographic Characteristics					
Children's age					
12-23 months	183 (72.05)	71 (27.95)	254 (56.07)	0.94	1.02 (0.67-1.54)
24-35 months	142 (71.36)	57 (28.64)	199 (43.93)		
Children's sex					
Male	160 (73.06)	59 (26.94)	219 (48.34)	0.55	1.13 (0.75-1.71)
Female	165 (70.51)	69 (29.49)	234 (51.66)		
Mother's age					
≤25 years	86 (74.78)	29 (25.22)	115 (25.39)	0.40	1.23 (0.76-1.99)
>25 years	239 (70.71)	99 (29.29)	338 (74.61)		
Father's age					
≤30 years	108 (73.97)	38 (26.03)	146 (32.23)	0.47	1.18 (0.76-1.84)
>30 years	217 (70.68)	90 (29.32)	307 (67.77)		
Mother's education					
Low	194 (88.99)	24 (11.01)	218 (48.12)	0.00*	6.42 (3.91-10.54)
Middle-High	131 (55.74)	104 (44.26)	235 (51.88)		
Father's education					
Low	147 (84,97)	26 (15.03)	173 (38.19)	0.00*	3.24 (1.99-5.25)
Middle-High	178 (63.57)	102 (36.43)	280 (61.81)		
Mother's employment					
Unemployed	123 (62.76)	73 (37.24)	196 (43.27)	0.00*	0.46 (0.30-0.69)
Employed	202 (78.60)	55 (21.40)	257 (56.73)		
Father's employment					
Unemployed	21 (77.78)	6 (22,22)	27 (5.96)	0.26	1.77 (0.65-4.77)
Employed	304 (71.36)	122 (28.64)	426 (94.04)		
Family size					
>5	92 (71.32)	37 (28.68)	129 (28.48)	0.88	0.97 (0.62-1.52)
≤5	233 (71.91)	91 (28.09)	324 (71.52)		
Number of children under five					
≥2	83 (76.85)	25 (23.15)	108 (23.84)	0.18	1.41 (0.85-2.34)
1	242 (70.1)	103 (29.9)	324 (71.52)		
Economic status					
Low	160 (86.02)	26 (13.98)	186 (41.06)	0.00*	3.80 (2.35-6.16)
Middle-high	165 (61.80)	102 (38.20)	267 (58.94)		
Residence					
Rural	267 (81.90)	59 (18.10)	326 (71.97)	0.00*	5.38 (3.44-8.43)
Urban	58 (45.67)	69 (54.33)	127 (28.03)		
Health Care Facility Factors					
Pregnancy care labor					
Non health worker	114 (94.21)	7 (5.78)	121 (26.71)	0.00*	9.34 (4.22-20.69)
Health worker	211 (63.55)	121 (36.45)	332 (73.29)		
Place of delivery					
Non health care facility	216 (93.51)	15 (6.49)	231 (50.99)	0.00*	14.93 (8.31-26.82)
Health care facility	109 (49.09)	113 (50.91)	222 (49.01)		

Table 1
Continue

Variables	Basic Immunization Status n (%)		Total n (%)	p-value	OR (95%CI)
	Incomplete	Complete			
Show immunization card					
No	138 (96.50)	5 (3.50)	143 (31.57)	0.00*	18.01 (7.17-45.23)
Yes	187 (60.32)	122 (39.35)	310 (68.43)		
Transportation to health care facility					
Do not know	14 (82.35)	3 (17.65)	17 (3.75)	0.00*	5.55 (3.51-8.77)
Difficult	213 (85.89)	35 (14.11)	248 (54.75)	0.03*	3.98 (1.14-13.97)
Easy	98 (52.13)	90 (47.87)	188 (41.50)		
Travel time to health care facility					
Do not know	14 (82.35)	3 (17.65)	17 (3.75)	0.00*	3.09 (1.89-5.04)
>23 minutes	137 (84.70)	26 (15.30)	168 (35.98)	0.15	2.49 (0.72-8.68)
≤23 minutes	174 (63.74)	99 (36.26)	273 (60.27)		
Cost to health care facility					
Do not know	14 (82.35)	3 (17.65)	17 (3.75)	0.49	1.55 (0.45-5.39)
>Rp. 14.000	91 (66.42)	46 (33.58)	137 (30.24)	0.10	0.69 (0.45-1.07)
≤Rp. 14.000	220 (73.90)	79 (26.10)	299 (66.01)		

Chi-square Test, *P-value< 0,05 statistically significant

There were 12 variables with a p-value <0.25 included in the multivariate analysis. The results of multivariate analysis in Table 2 shows that children who did not have immunization cards and were not born in a healthcare facility were more likely to be incompletely vaccinated (OR=6.82; 95%CI=2.65-17.56; OR=6.05; 95%CI=3.14-11.66). Children who live in low economic status had a high possibility to get incomplete basic immunization (OR=1.97; 95%CI=1.10-3.54). Children with low maternal education also tend to get incomplete basic immunization (OR=2.00; 95%CI=1.09-3.65).

Table 2
Multivariate Analysis of Factors Associated with Incomplete Basic Immunization

Variables	B	OR	95%CI	P-value
Show immunization card				
Yes		Ref		
No	1.92	6.82	2.65-17.56	0.00*
Place of delivery				
Health care facility		Ref		
Non health care facility	1.80	6.05	3.14-11.66	0.00*
Economic status				
Middle-high		Ref		
Low	0.68	1.97	1.10-3.54	0.02*
Mother's education				
Middle-high		Ref		
Low	0.69	2.00	1.09-3.65	0.02*

Logictic regression test. *P-value <0.05 statistically significant

DISCUSSION

High coverage of complete basic immunization is important to reduce child mortality and morbidity that can be prevented through immunization. The WHO through the World Health Assembly (WHA) in 2012 recommended a global action plan for 2011-2020 to set a minimum national immunization coverage of 90% and immunization coverage in districts/cities of at least 80% (12). Therefore, the coverage of basic immunization in Papua Province was still far below the national and also the district's target. Measles immunization coverage in Papua showed the highest coverage compared to other kind basic vaccine. However, this achievement still could not reach national target.

Immunizations that require a booster, such as DPT-HB/DPT-HB-HiB and polio also showed the lowest coverage rates. In 2020, the WHO stated that around 17.10 million babies worldwide did not receive the first dose of DPT vaccine due to lack of access to immunization and other health services and an additional 5.6 million were partially vaccinated (13). Considering that the majority of our respondents delivered in non-health facilities; it means they were not assisted by a health professional birth attendant. So, it means the coverage of HB0 and BCG vaccines that were given in the early birth was still low.

Globally, disparity of birth delivery in health facilities by a professional birth attendant in low-middle and high-income countries still happens. In a developing country, a traditional birth attendant is still a preference to help birth delivery. This condition is related with availability, affordability, accessibility, and friendly and caring attitude of traditional birth attendants. Culture condition, tradition and belief are also associated with public trust to traditional birth attendants (14)

Children who were born in non-healthcare will have a greater risk for incomplete immunization. Previous study in Benin and Nigeria, showed that complete immunization coverage was lower in mothers who delivered in non-healthcare facilities and were not assisted by health professional birth attendant (15,16). This association might be related with the fact that professional birth attendants usually educate their patients to immunize their children. Birth attendants provide comprehensive information on postnatal programs, including immunization programs (17). In contrast to this, study in Malawi and Ethiopia showed that place of delivery was not a significant factor associated with default of basic immunization in children (18).

Another healthcare factor, which was immunization card, also could increase the risk for incomplete immunization. Previous study in Malawi stated that children who had no immunization card or whose card was lost had increased odds of being both non- and under-vaccinated (18). Another study in Senegal showed that mothers of children under five who had an immunization record card were seven times more likely to receive complete immunizations (19). Study in 10 countries with the most unvaccinated children show that the majority of children's families could not show their child immunization cards to the health officer (20).

The absence of an immunization card can be related to the presence of mothers under five at health facilities that provide immunization services. The data from the 2017 Senegalese Demographic and Health Survey show that there was a delay in giving immunizations to children who do not have immunization card (21). Immunization card function was to record immunization history. In case the card was lost or failed to be brought to the health service at immunization schedule, previous immunizations history would be failed to be monitored and lead to misinformation of immunization coverage (22).

Sociodemographic factors also significantly associated with incomplete basic immunization of children under five in Papua, mainly low economic status and low mother education. In line with study in Senegal and East Africa, both studies showed that poverty becomes a determinant for immunization default (8,19). Previous study in Afghanistan and Myanmar stated that children born in prosperous families were more likely to receive complete immunizations, compared to children born in poor families (23,24). Otherwise, there were some studies which showed that economic status was not the main factor of incompleteness of childhood immunizations (22,25).

Our data indicate that more than half of subjects were categorized in low economic families. Economic inequity between regions in Papua still remains a problem, related with extreme demographic condition. The majority of poverty pockets of Papua were in mountainous areas with difficult access. This condition is associated with the lack of health service facilities and infrastructure that hinder immunization programs (26).

Previous study explained that family with low-income condition was prone to have a risky, addictive and health neglecting behaviors. Some negative behavior could affect children who still depend on parents. In other words, negative behavior of low socioeconomic family was transgenerational. Universal health insurance tried to improve healthcare services access for low socioeconomic populations; however it was still unable to decrease the intergenerational transmission of socioeconomic circumstances and health. Parents who postponed their healthcare were more likely to postpone their children's healthcare as well, possibly due to low understanding of the healthcare system (27).

Besides economic status, children with low maternal education are also in a greater risk for incomplete immunization. A study in Ethiopia stated that mothers/guardians of children who have never had formal education have a 2.6 times higher risk of having a history of incomplete immunization. Mothers with higher education and being well-educated have the knowledge and the ability to make better decisions about children's health services, including knowing the importance of immunization for children (28). Mothers with higher education were easier to receive knowledge and information about the importance of immunization for children. A study in Ethiopia showed that children with a history of incomplete immunization were found six times higher in parents with less knowledge about immunization (29).

Mothers with higher education will visit health facilities or contact healthcare providers more. In Ethiopia, the coverage of the 3rd to 5th doses of TT vaccination was lower, 55%, compared to the 1st and 2nd doses of TT. In children with mothers without formal education, this risk was 2.5 times higher (28). However, a study in Ghana showed that maternal education was not a determinant of incomplete immunization in children (30). Our results support the hypothesis that children of mothers with high education have the opportunity to get complete immunizations compared to children with mothers with low education.

CONCLUSION

This study revealed that sociodemographic and health services contributed to the default of complete basic immunization for children under five in Papua. Risk factors related with health services were the absence of immunization record cards and non-health professional birth attendants. Sociodemographic factors that significantly related with incomplete immunization were children with low economic status and low education mother. Improvement efforts in prenatal, perinatal, and postnatal efforts need to be made so that the community can easily reach immunizations in a health facility, especially in children with low socioeconomic and low maternal education. Furthermore, health promotion about the importance of basic immunization in children needs to be held continuously.

CONFLICT OF INTEREST

Authors declared no conflict of interest

AUTHOR CONTRIBUTIONS

IPA contributed to conceptualizing the article, designing the methodology, processing the data, writing the article draft, and editing. Similarly, SNW contributed to conceptualizing the article, designing the methodology, writing the article, reviewing, and editing.

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