ISSN. 2338-7475
E-ISSN. 2620-7869
Hearty
Jurnal Kesehatan Masyarakat
Berinan, Tulus, Sepenuh Hati,Berbesar Hati, Jujur, Sehat dan Kuat
Vol. 13 No. 5, Oktober 2025, Hal. 1243-1249

IMMUNIZATION AND CHILD NUTRITION FACTORS ON MEASLES INCIDENCE IN JRAKAH VILLAGE, BOYOLALI, 2025

Lorda Presenta [1*], Nur Aziza[1], Mateus Sakundarno Adi [2], Suhartono [3], Teguh Tri Kuncoro [4]
[1] Field Epidemiology Training Program, Faculty of Public Health, Universitas Diponegoro
[2] Department of Epidemiology and Tropical Disease, Faculty of Public Health, Universitas Diponegoro
[3] Department of Enviromental Health, Faculty of Public Health, Universitas Diponegoro
Jl. Prof. Jacub Rais, Tembalang, Semarang, Jawa Tengah, 50275, Indonesia
[4] Boyolali Regency Health Office
Jl. Pandanaran No.156, Gudang, Siswodipuran, Kec. Boyolali, Kabupaten Boyolali, Jawa Tengah 57311, Indonesia
Email: lordapresentaa@gmail.com

Abstract

On January 2025, the Selo Health Center reported seven measles cases at Jrakah Village. The study purposed to determine the relationship between immunization and nutritional status with measles outbreaks. This study used an analytical observational method with a 1:6 case-control study design. The sample of this study was 49 respondents who were selected using random sampling techniques in the at-risk population, and interviews and questionnaires were carried out for data collection. Data analysis was done using the Anthropocal calculator and the Chi-square test. The results of statistical analysis showed a relationship between basic immunization status (p-value = 0.041; OR = 8.824; 95%CI = 0.973 - 80.019), BIAS immunization status (p-value = 0.007; OR = 30.750; 95%CI = 2.562 - 369.092), and nutritional status (p-value = 0.016; OR = 9.867; 95%CI = 1.690 - 57.600) with a measles outbreak. Basic immunization status, BIAS immunization status, and nutritional status were risk factors for the measles outbreak at Jrakah Village. However, basic immunization status was not statistically significant as a risk factor for the measles outbreak at Jrakah Village. This could be due to the small number of samples and limited data in the study. Therefore, it is recommended that immunization coverage be increased and additional food (PMT) provided to improve nutritional status and minimize measles infection.

Keywords: Measles, Immunization, Nutritional, Outbreak, Boyolali

Introduction

Measles is a contagious re-emerging disease that attacks the systemic system and respiratory tract, which is fatal (1,2). Measles is caused by infection with the Morbillivirus virus (family Paramyxoviridae) (2,3). The mortality rate of measles in developing countries is 5%, and it is the cause of death in children accompanied by complications (2,3). Complications of measles include diarrhea, respiratory tract disorders, malnutrition, otitis media, blindness, encephalitis, oral mucosal ulcers, enteritis, and cervical lymphadenitis (2,4,5). Groups at risk for measles infection and suffering complications are ages 5-20 years and individuals with specific conditions such as malnutrition, vitamin A deficiency, people with HIV, and pregnant women (2,6,7).

Measles transmission occurs through droplets or aerosol particles through the air (airborne disease) (7). Droplets that come out of the respiratory tract contain infectious viruses. If inhaled, it will cause primary respiratory tract infection (7,8). The measles transmission occurs 4 days before and after the prodromal stage (7). Meanwhile, the measles incubation period lasts 7-18 days, with an average

Submitted: June-2025 Received: August-2025 Available Online: October-2025

incubation period of 10 days (3). The symptoms that arise are fever (≥38℃), rash, and accompanied by one or more additional symptoms such as cough, runny nose, and red eyes (3). The typical symptom is Koplik's Spot or a grayish-white patch at the base of the inner cheek (3,5).

The incidence of measles is influenced by several factors, such as age, gender, maternal education, maternal knowledge, maternal attitude, maternal actions, maternal measles history, economic status, environment, residential density, household contacts, immunization status, and nutritional status (9,10). Measles cases often occur in the pre-school age group (3-6 years) and school age (7-12 years). However, measles infection in toddlers can be more severe because the immune system has not been fully formed (11). Meanwhile, in the age group ≥20 years, measles infection will be more severe due to immunodeficiency, poor nutritional status, vitamin A deficiency, and so on (2,11).

Efforts to prevent the spread of measles by providing immunization. Vaccination aims to increase immunity and form antibodies (12). To obtain optimal immunity to measles, measles immunization is carried out 3 times at 9 months, 18 months, and children in grade 1 of elementary school (12). Indonesia is a country that is recorded as a country with a high number of children who have not received immunization (13). In Indonesia, measles-rubella immunization coverage (MCV1) is ≥ 95%. However, measles-rubella immunization coverage (MCV2) has not met the target (<95%). The failure to achieve the target for measles-rubella immunization coverage (MCV 1 and 2) has caused Indonesia to experience frequent measles outbreaks because many individuals only receive one dose of the measles vaccine. So, vaccine efficacy is only 85% and cannot form immunity (9).

Nutrition is an essential element in all growth and development processes in the human life cycle. An individual's nutritional status affects the pattern of infectious diseases (14). Individuals who have received complete measles vaccination are at risk of being infected with measles if they have poor nutritional status (10). Malnutrition by inhibiting antibody formation after vaccination (11). Children with poor nutritional status (malnutrition) are more susceptible to disease. Inadequate nutrition affects the function of the immune response, thereby reducing the body's resistance, worsening the condition of the disease, and causing death (15).

Until now, measles cases in Indonesia are still often found. In 2023, there were 39,360 suspected cases of measles and 10,308 confirmed positive cases of measles (13). In 2023, Central Java Province contributed 3,517 suspected measles cases and 1,072 confirmed positive measles cases (16). Measles cases found in 2024 were 5,119 suspected cases, and 326 confirmed positive measles cases (17). Based on data from the Boyolali Regency Health Office, measles cases have fluctuated over the past 4 years. In 2020, 17 suspected cases were found (IR 1.6 per 100,000 population); in 2021, 18 suspected cases were found (IR 1.7 per 100,000 population); in 2022, 123 suspected cases were found (IR 11.4 per 100,000 population), and in 2023, 93 suspected cases were found (IR 8.5 per 100,000 population)(18).

On January 6, 2025, the Selo Health Center Surveillance officers reported to the Health Surveillance and Immunization Section, Boyolali District Health Office, which found seven measles cases, and laboratory tests were carried out (IgM Serology). Based on the results of the laboratory tests, it was stated that there was one confirmed case and six suspected cases. This study aims to determine the factors of immunization and nutritional status in the measles outbreak at Jrakah Village.

Methods

This study used an analytical observational study design with an unmatched case-control approach of 1:6. The study population was a group of children (6-12 years) and adolescents (13-17 years) who live in Jrakah Village. Sample determination was done using a random sampling technique with an active case-finding approach to the at-risk population. Case criteria are individuals who experience symptoms such as fever (>38℃) and rash accompanied by one or more additional symptoms. Control criteria are individuals who do not experience symptoms and have close contact with cases. This study's independent variables are basic immunization and nutritional status. Meanwhile, the dependent variable is the measles outbreak at Jrakah Village. Data collection was carried out using a questionnaire. Data analysis was carried out using the Chi-Square test. This study has obtained ethical approval from the Faculty of Public Health, Diponegoro University (87/EA/KEPK-FKM/2025).

Results

1. Univariate Analysis

Table 1. Characteristic Based on People

Category	Sum(N)	%
Gender		
Male	35	71.4
Female	14	28.6
Total	**49**	**100.0**
Age		
Children (6 –12 Years)	47	95.9
Teenager (13 – 18 Years)	2	4.1
Total	**49**	**100.0**
Basic Immunization Status		
Complete	26	53.1
Uncomplete	23	46.9
Total	**49**	**100.0**
BIAS Immunization Status		
Yes	45	91.8
No	4	8.2
Total	**49**	**100.0**
Nutritional Status		
Malnutrition	9	18.4
Normal	40	81.6
Total	**49**	**100.0**

Based on table 1 shows that most respondents are male (71.4%) compared to female (28.6%). Most respondents are in the child age group (6-12 years) (95.9%) rather than adolescents. Respondents' immunization status is divided into two, namely basic immunization status and BIAS immunization status. Almost half of respondents have an incomplete basic immunization status (46.9%). Four respondents didn't receive BIAS immunization (8.2%), and nine had malnutrition (18.4%).

2. Bivariate Analysis

Table 2. Bivariate Analysis Correlation Basic Immunization Status and Nutritional Status

Variable	Measles				p-Value	OR	95%CI
	Yes		No				
	N	%	N	%			
Basic Immunization Status							
Complete	1	14.3	17	40.5	**0.041***	8.824	0.973 – 80.019
Uncomplete	6	85.7	25	59.5			
BIAS Immunization Status							
Yes	4	57.1	41	97.6	**0.007***	30.750	2.562 – 369.092
No	3	42.9	1	2.4			
Nutritional Status							
Malnutrition	4	57.1	5	11.9	**0.016***	9.867	1.690 – 57.600
Normal	3	42.9	37	88.1			

Based on the table 2, it shows that:

1. Basic immunization status is related to the measles outbreak in Jrakah Village (p-value = 0.041 < 0.05). However, basic immunization status is not statistically significant as a risk factor for measles outbreaks. Basic immunization status has an OR value of 8.824, meaning that respondents with incomplete basic immunization status are at risk of 8.8 times being infected with measles.
2. BIAS immunization status is related to the measles outbreak in Jrakah Village (p-value = 0.007 < 0.05). BIAS immunization status has an OR value of 30.7, meaning respondents who do not receive BIAS immunization are at risk of 30.7 times being infected with measles. Based on POR (95%CI), BIAS immunization status can be stated as a risk factor for the measles outbreak in Jrakah Village.
3. Nutritional status has a significant relationship with the occurrence of measles outbreak in Jrakah Village (p-value = 0.016 <0.05). Nutritional status has an OR value of 9, which means that malnourished respondents are 9 times more at risk of being infected with measles. Based on the POR (95%CI), nutritional status can be stated as a risk factor in the measles outbreak at Jrakah Village.

This study's small sample size affects the accuracy of the results depicted in the wide confidence interval (95%CI).

Discussions

Based on the Regulation of the Minister of Health No. 12 of 2017, immunization aims to increase individual immunity, replacing maternal immunity, which begins to decrease at the age of 6 months after birth (2,12,19). Immunization is carried out to minimize the severity of infection and cause complications. In addition, immunization is carried out to form community immunity (herd immunity) (20). The measles vaccine aims to help reduce the number of illnesses, disabilities, and deaths caused by PD3I diseases (20).

Measles is one of the diseases that can be prevented by Immunization (PD3I). The administration of the measles vaccine aims to form an active immune system in children. To obtain optimal protection and immunity, children need to be immunized according to the dose (21). Measles immunization is given 3 times to children aged 9 months, 18 months, and grade 1 of elementary school (12). To prevent outbreaks and eliminate measles, the World Health Organization (WHO) targets 95% of children to

receive two doses of measles vaccination (7). High vaccine coverage will help provide individual and group protection and can stop the transmission of measles (21).

The statistical analysis results show that basic immunization status (p-value = 0.041) and BIAS immunization status (p-value = 0.007) are related to the measles outbreak at Jrakah Village. However, basic immunization status is not statistically significant to be stated as a risk factor for the measles outbreak. Basic immunization status (OR = 8.8) and BIAS immunization status (OR = 30.7) have large odds ratio values. So, individuals who do not receive the measles vaccine in basic immunization and BIAS immunization have a greater chance of being infected with measles.

The target for measles vaccination coverage in Indonesia is 95% at the national level and 80% at the district/city level (2). The coverage of basic immunization in infants in Central Java Province for the past 5 years has fluctuated (20). For the past 3 years, the coverage of measles-rubella immunization in Boyolali Regency has exceeded the target (> 85%). However, the coverage of advanced measles-rubella immunization has not yet reached the target (<85%). Basic immunization coverage in 2019-2024 in Jrakah Village has reached >95%, with an average coverage of 101.6%. However, they didn't record basic immunization coverage in the year the cases were born properly at the Selo Health Center. Meanwhile, the coverage of advanced immunization (BIAS) from 2019-2024 has reached ≥80%, showing that almost all students have received advanced measles-rubella immunization.

Measles immunization coverage can affect vaccine efficacy in children. Children who receive two doses of measles vaccine can increase vaccine efficacy by 92-95% and form lifelong immunity (3,7). The administration of the second and subsequent doses of the measles vaccine (booster) aims to increase protective antibody levels and extend protection in children (2,4). The level of vaccine effectiveness in individuals is influenced by several other factors, such as age, vaccine used, nutritional status, and so on (22).

Previous studies have stated that individuals who do not receive measles vaccine are at higher risk of measles infection. This is caused by the absence of the formation of the immune system and measles antibodies (5,19,23). In addition, individuals who do not receive measles-rubella immunization are at risk of experiencing severe measles infection and complications (5,11). Individuals who have received measles immunization are also at risk of measles infection. However, the measles infection is not too severe (19).

The severity of measles infection is not only determined by immunization status. An individual's nutritional status affects health and can worsen infection (24,25). Determination of individual nutritional status is carried out using two different methods. In the child age group, determining nutritional status is based on Permenkes No. 2 of 2020 concerning Child Anthropometric Standards and the AnthroCal calculator (12). The statistical analysis results show that nutritional status in children is significantly related to the incidence of measles (p-value = 0.017 and OR = 9.867). Thus, individuals with poor nutritional status or malnutrition are at risk of suffering from measles infection.

Malnutrition can damage the body's defense system, making it more susceptible to infectious diseases like measles (24). If a child has received complete measles vaccination but has poor nutritional status, it will inhibit the formation of antibodies by the vaccine (11). Malnutrition inhibits virus eradication, which results in late diagnosis (26). Therefore, individuals with poor nutritional status are more susceptible to suffering from infectious diseases compared to children with good nutritional status and excess nutrition (11). Individuals with poor nutritional status have a greater chance of suffering from severe measles infections, complications due to measles, and even death (4,5,26).

Conclusions

The incidence of measles in Jrakah Village was mostly found in males aged 6-12 years. The BIAS immunization factor and nutritional status have a significant relationship and are risk factors for measles. Meanwhile, the basic immunization factor is related to the incidence of measles. However, it is not statistically significant to be stated as a risk factor for measles. It is recommended that the coverage of measles immunization, both in basic and advanced immunization, be increased to increase individual immunity and form immune immunity. In addition, it is necessary to provide additional food (PMT) to toddlers and children at risk of malnutrition.

References

[1] Jannah RR. Analisis Input Sistem Surveilans Campak (Measles) di Dinas Kesehatan Kota Padang Tahun 2022 [Internet]. [Padang]: Andalas University; 2022 [cited 2025 Jun 2]. Available from: http://scholar.unand.ac.id/201196/

[2] Falawati WOF, Supodo T, Sunarsih. Hubungan Status Imunisasi dan Peran Petugas Imunisasi dengan Kejadian Campak di Kabupaten Muna. Midwifery Journal | Kebidanan [Internet]. 2020 Jan [cited 2025 Jan 11];5(1):60–4. Available from: https://repository.unar.ac.id/jspui/bitstream/123456789/2506/1/document%20%2810%29.pdf

[3] Kementerian Kesehatan Republik Indonesia. Petunjuk Teknis Surveilans Campak - Rubella. Kelyombar C, Herini ES, editors. Jakarta: Kementerian Kesehatan Republik Indonesia; 2023. 1–134 p.

[4] Ardhiansyah F, R. KB, Suwondo A, Setiawati M, Kartini A. Faktor Risiko Campak Anak Sekolah Dasar pada Kejadian Luar Biasa di Kabupaten Pesawaran, Provinsi Lampung. Jurnal Epidemiologi Kesehatan Komunitas. 2019;4(2):64–72.

[5] Asy-syifaa, Kurniasih A, Lubis SA, Damanik RZ. Karakteristik Kejadian Campak Pada Anak di RSUD DR. Fauziah Kabupaten Biruen Tahun 2022. 2024;7(1):24.

[6] Yahmal PN. Faktor - Faktor Yang Berhubungan dengan Kejadian Campak. JMH : Jurnal Medika Hutama [Internet]. 2021;03(01):1612–5. Available from: http://jurnalmedikahutama.com

[7] Maulana A. Aspek Klinis, Diagnosis dan Tatalaksana Campak pada Anak. Jurnal Kedokteran Nanggroe Medika. 2021;4(3):21–7.

[8] Ramadhani FH, Azizah R, Jalaludin J, Martini S, Sulistyorini L. Meta-Analysis and Systematic Review: Risk Factors of Measles Incidence in Indonesia (2012 – 2021). Jurnal Kesehatan Masyarakat. 2023 Jul 9;19(1):138–48.

[9] Riantina A, Najmah N, Sitorus RJ. Analisis Faktor Risiko Yang Memengaruhi Kejadian Campak Di Indonesia: Literatur Review. Journal of Nursing and Public Health. 2024;12(1):122–32.

[10] Yalpira B. Hubungan Status Imunisasi dengan Kejadian Komplikasi Pada Pasien Campak Anak di RSUD Raden Mattaher Jambi Tahun 2022 dan 2023 [Internet]. [Jambi]: Universitas Jambi; 2024 [cited 2025 Feb 12]. Available from: https://repository.unja.ac.id/72609/

[11] Rahadatunnisa NL, Aslinar A, Cahyady E. Hubungan Usia, Status Gizi Dan Status Imunisasi Dengan Kejadian Campak Pada Anak Usia 0 - 5 Tahun Di RSUD Meuraxa Banda Aceh. Jurnal Medika Malahayati. 2024 Jan 15;7(4):939–45.

[12] Kementerian Kesehatan RI. Peraturan Menteri Kesehatan Republik Indonesia No. 12 Tahun 2017 Tentang Penyelenggaraan Imunisasi. Permenkes No. 12 Tahun 2017 Indonesia; 2017.

[13] Kementerian Kesehatan Republik Indonesia. Profil Kesehatan Indonesia Tahun 2023. Jakarta; 2024.

[14] Afifah CAN, Ruhana A, Dini CY, Pratama SA. Buku Ajar Gizi Daur Kehidupan. 1st ed. Wahyuni ES, Sulandjari S, editors. Vol. 1. Yogyakarta: Deepublish; 2022. 1–186 p.

[15] Sari RP, Agustin K. Analisis Hubungan Status Gizi Dengan Kejadian Penyakit Infeksi Pada Anak Balita Di Posyandu Wilayah Puskesmas Colomadu I. Jurnal Ilmu Keperawatan dan Kebidanan. 2023 Feb 5;14(1):171–8.
[16] Dinas Kesehatan Provinsi Jawa Tengah. Buku Saku Kesehatan Provinsi Jawa Tengah Tahun 2023 [Internet]. Semarang: Dinas Kesehatan Provinsi Jawa Tengah; 2023 [cited 2024 Apr 20]. 1–210 p. Available from: https://dinkesjatengprov.go.id/v2018/dokumen/1Buku_Saku_Kesehatan_2023/mobile/index.html
[17] Dinas Kesehatan Provinsi Jawa Tengah. Buku Saku Kesehatan Provinsi Jawa Tengah Tahun 2024. Semarang: Dinas Kesehatan Provinsi Jawa Tengah; 2024. 1–188 p.
[18] Dinas Kesehatan Kabupaten Boyolali. Profil Kesehatan Kabupaten Boyolali Tahun 2023 [Internet]. Boyolali; 2024 [cited 2024 Jul 25]. 1–200 p. Available from: https://dinkes.boyolali.go.id/doc/profil/PROFIL_DINKES_2023_CETAK_FULL.pdf
[19] Fadhila D, Selviana S. Faktor Resiko dan Spasial Kejadian Campak Pada Anak di Kota Pontianak Tahun 2023. Jurnal Kesehatan Lingkungan Indonesia. 2024 Feb 1;23(1):84–92.
[20] Dinas Kesehatan Provinsi Jawa Tengah. Profil Kesehatan Jawa Tengah Tahun 2023. 2024. 1–267 p.
[21] Plans-Rubió P. Measles Vaccination Coverage and Anti-Measles Herd Immunity Levels in the World and WHO Regions Worsened from 2019 to 2023. Vaccines (Basel). 2025 Feb 5;13(2):157.
[22] Muniroh, Abrori I, Cahyati WH, Rahayu SR. Investigasi Kejadian Luar Biasa Campak Di Kota Purwokerto, Kabupaten Banyumas, Tahun 2016. Seminar Nasional Pascasarjana 2020. 2020;928–38.
[23] Faradiba N. Faktor - Faktor Yang Berhubungan dengan Kejadian Campak pada Balita di Indonesia (Analisis Data SSGI 2022) [Internet]. [Jambi]: Universitas Jambi; 2024 [cited 2025 Feb 13]. Available from: https://repository.unja.ac.id/73434/
[24] Hamzah H, Hendrati LY. Kasus Campak Pada Kasus Campak Yang Di Vaksinasi Menurut Provinsi di Indonesia Tahun 2018 - 2020. Jurnal Ilmiah Permas: Jurnal Ilmiah STIKES Kendal. 2022;13(1):149–56.
[25] Arianto M, Setiawati M, Adi MS, Hadisaputro S, Budhi K. Beberapa Faktor Risiko Kejadian Campak Pada Balita di Kabupaten Sarolangun. Jurnal Epidemiologi Kesehatan Komunitas. 2018;3(1):41–7.
[26] Batubara AR, Oktaviani W. Faktor Risiko yang Memengaruhi Kejadian Campak di Wilayah Kerja Puskesmas Kuta Makmur Kabupaten Aceh Utara. Journal Of Healthcare Technology And Medicine. 2018 Oct 15;4(2):225.