Available *online* at : http://ejurnal.stikesprimanusantara.ac.id/

Jurnal Kesehatan

| ISSN (Print) 2085-7098 | ISSN (Online) 2657-1366 |

Research Article

Immunization Status and Risk of Measles/Rubella Incidence During Outbreak

Yurnila[*1], *Evi Martha*[2]

[1] *Master of Public Health Study Program, Faculty of Public Health, University Indonesia*
[2]*Department of Health Education and Behavioral Sciences, Faculty of Public Health, University Indonesia*

ARTICLE INFORMATION

Received: September, 27, 2023
Revised: October, 20, 2023
Accepted: February, 29, 2024
Available online: March, 30, 2024

KEYWORDS

Adolescent Father, Experience, Fatherhood

CORRESPONDING AUTHOR

Yurnila

E-mail: iyhanilayurnila@gmail.com

A B S T R A C T

Background: In 2018, measles remained a leading cause of morbidity and mortality worldwide, with over 9.7 million cases and more than 140,000 deaths associated with this disease. Additionally, rubella also has long-term health consequences, with an estimated 103,000 infants born with Congenital Rubella Syndrome (CRS). In 2022, there was a significant increase in the number of laboratory-confirmed measles cases, totaling 4,845 cases, with six resulting in death (CFR 0.1%). Some of the provinces most affected were Aceh, West Sumatra, and East Java. In 2022, the city of Pariaman was declared a state of emergency (KLB) for measles.

Aims: To analyze the link between immunization status and measles/rubella incidents during the KLB event in Pariaman City in 2022.

Method: Quantitative research with a case-control design. In this study, the researchers used secondary data contained in the annual report of Pariaman City Health Service for 2022. The researchers employed a parametric test with Chi-Square statistical test using the IBM SPSS computer program to determine the interaction between the two variables.

Results: The results of the study showed that there was a relationship between a history of immunization and the occurrence of measles/rubella in Pariaman City. P = 0.032 (p < 0.05). An OR value of 3.25 (95% CI = 1.209 – 8.733) indicated that a history of non-immunization had a 3.25 times greater risk of exposure to measles/rubella than a history of immunization.

Conclusion: Immunization history affects the outbreak in Pariaman City in 2022.

INTRODUCTION

Measles remains a leading cause of morbidity and mortality worldwide, with an estimated 9.7 million cases and over 140,000 measles-related deaths in 2018. Rubella carries long-term health consequences, with an estimated 103,000 infants born with congenital rubella syndrome (CRS). These characteristics position measles and rubella as key indicators of the quality and strength of national immunization programs and public health and healthcare systems.[1].

Measles is an endemic disease routinely reported annually in Indonesia. In 2022, there was a significant increase in the number of confirmed cases, with 4845 measles cases verified through laboratory testing, resulting in six deaths (CFR 0.1%). This occurrence was documented in 32 out of 38 provinces in Indonesia. Provinces most affected included Aceh with 859 cases, West Sumatra with 859 cases, Riau with 500 cases, and East Java with 459 cases. Analysis of annual trends indicates a considerable surge in reported cases in 2022 compared to previous years. In 2018, 920 cases were reported, followed by 639 cases in 2019, 310 cases in 2020, and 132 cases in 2021. [2].

According to data from the Central Statistics Agency (BPS), the average coverage rate of the National Measles-Rubella (MR) Immunization in 2022 was 70.14% [3], the attainment of measles-rubella (MR) immunization among infants in the West

DOI: http://dx.doi.org/10.35730/jk.v15i1.1055

Sumatra Province is 32.4% [4] meanwhile, the MR immunization coverage in Pariaman City reached 44.5%, which is still far below the set target of 95% [5]. The low coverage of MR vaccination poses a significant potential for outbreaks of measles/rubella diseases due to the absence of immunity against the disease virus and the failure to establish herd immunity within the population.

Administering measles/rubella vaccination provides protection for children against the possibility of measles and rubella infection by establishing immunity in the child's body against both diseases[6]. Experts report several factors that can influence the occurrence of measles, one of which is immunization status [7]. The investigation results of the outbreak in the city of Pariaman from April to November 2022, conducted by the Surveillance and Immunization Division of the Pariaman City Health Office, revealed 503 suspected cases of measles/rubella. The age distribution was as follows: below 1 year, 3 individuals; 1 – 4 years, 248 individuals; 5 – 9 years, 168 individuals; 10 – 14 years, 42 individuals; 15 – 19 years, 9 individuals; and 20 – 44 years, 33 individuals [5]. From a total of 503 suspected measles cases, only 78 specimens were sent to the West Sumatra Provincial Health Office to determine measles/rubella positivity. Among them, 43 cases tested positive for measles, 1 case for rubella, and 34 cases tested negative. In accordance with Minister of Health Regulation No. 1501 of 2010 regarding specific infectious diseases that can cause outbreaks and their control efforts, Pariaman City was declared an Extraordinary Incident (EI) for measles[5].

In a study conducted by Asimina Nasika, the results indicated a measles outbreak during 2017–2018. This outbreak predominantly affected individuals who were either unvaccinated or had incomplete vaccination histories [8]. The Outbreak (KLB) in the city of Pariaman is associated with the success of the MR Immunization Program. Although the measles/rubella immunization program has been implemented, there are still many target groups who have not received measles/rubella immunization. The decline in measles/rubella immunization coverage is caused by various factors such as concerns about vaccine safety and vaccine side effects [9], the low educational attainment of mothers and economic status also influence the low immunization coverage[10], in addition, issues such as the halal status and composition of vaccine ingredients have become a concern due to differences in thought patterns and individual beliefs. The rapid spread of inaccurate information in the community also has an impact, particularly regarding the perception that immunization can cause autism, disabilities, or even death in children. [7]. Based on research conducted by Laras Arsyi Insani et al. (2022), it is shown that there is a strong correlation between the population and toddlers who have not received measles immunization with the incidence of measles in the Special Capital Region of Jakarta, indicating a very strong positive correlation.[11]

This research is expected to contribute to understanding the importance of measles-rubella (MR) immunization coverage in preventing the spread of measles/rubella in the community. Based on the aforementioned exposition, the aim of this study is to analyze the relationship between immunization status and the occurrence of measles/rubella during the outbreak in the city of Pariaman in 2022.

METHOD

The study employed a case-control survey as its research strategy. A case-control survey is an analytical study that investigates the examination of risk factors using a retrospective approach [12]. The research was carried out at the Health Office of Pariaman City between August 1st and August 15th, 2022. The population for this study included all persons suspected of having measles who underwent laboratory evaluation. There were a total of 78 individuals, with 44 cases testing positive for measles/rubella and 34 cases testing negative (control group). The sampling strategy used was total sampling. This study employed secondary data obtained from the annual report of the Immunization Surveillance Section of the Disease Control and Eradication Program Division (P2P) of the Pariaman City Health Department in 2022. The interaction between the two variables was explored by conducting parametric testing utilizing the Chi-Square statistical test through the IBM Statistical Package for the Social Sciences (SPSS) program.

 DOI: http://dx.doi.org/10.35730/jk.v15i1.1055

RESULT AND DISCUSSION

Table 1. Characteristics of Suspected Measles/Rubella Respondent During Outbreak in Pariaman

Characteristics	Measles/Rubella					
	Case		**Control**		**Total**	
	Frequency (n)	**%**	**Frequency (n)**	**%**	**Frequency (n)**	**%**
Sex						
Male	22	50	8	23,5	30	38,5
Female	22	20	26	76,5	48	61,5
Total	**44**	**100**	**34**	**100**	**78**	**100**
Age						
Toddler (1 – 5 Th)	17	38,6	5	14,7	22	28,2
Children (>5 – 10 Th)	16	36,4	5	14,7	21	26,9
Teenager (>10 – 19 Th)	7	15,9	4	11,8	11	14,1
Adult (>19 – 44 Th)	4	9,1	20	58,8	24	30,8
Total	**44**	**100**	**34**	**100**	**78**	**100**

Table 1 shows that out of a total of 44 respondents, 22 individuals (50%) were male and 22 individuals (50%) were female in the case group, while in the control group, a majority of respondents were female (76.5%). According to research conducted by Khuril Eka Oktaviasari, there was a difference in the number of measles cases between 2015 and 2016. In 2015, more measles cases occurred in males, whereas in 2016, more cases occurred in females [13]. The conclusion of the above study is that measles can affect individuals regardless of gender. This is contingent upon each individual's level of immunity, as vaccines have an efficacy rate of approximately 85%. Therefore, the likelihood of someone lacking immunity is relatively high, rendering them vulnerable to measles infection[14].

Most cases occurred in children aged 1-5 years (38.6%), while the majority of respondents in the control group were aged >19-44 years (30.8%). This aligns with research conducted by Juniarti et al., indicating that the age range at risk of measles is <15 years (95.2%).[15]. Measles disease generally tends to affect individuals within specific age groups, with the largest affected group being those under 15 years old, in accordance with the Minimum Age Convention No. 138 of 1973. Research findings indicate that the majority of measles cases occur in individuals below 15 years old. This could be attributed to the fact that children in this age group typically lack active immunity against measles, especially if they have not received measles vaccination. According to research, the measles antibody titer levels in children aged 10 to 12 years are only around 50%, thereby increasing their susceptibility to measles [14].

Tabel 2. The Distribution of Case and Control Proportions According to the Vaccination History of Suspected Measles/Rubell Outbreak in the City of Pariaman

Variable	**Measles/Rubella**					
	Case		**Control**		**Total**	
	Frequency (n)	**%**	**Frequency (n)**	**%**	**Frequency (n)**	**%**
Immunization History						
Unimmunized	22	50	8	23,5	30	38,5
Immunized	22	50	26	76,5	48	61,5
Total	**44**	**100**	**34**	**100**	**78**	**100**

Based on Table 2, it is observed that the distribution of case and control proportions according to immunization history indicates that among the case group respondents, 22 individuals (50%) were immunized, whereas among the control group respondents, 48 individuals (61.5%) were immunized. Measles/rubella (MR) vaccination is administered in three doses, at 9 months, 18 months, and upon entering 1st grade with injection given in the upper left arm. According to data obtained from the

Pariaman City Health Office, measles/rubella (MR) immunization coverage at 9 months is 82.9%, at 18 months is 46.4%, and measles/rubella immunization coverage for elementary school children is 43.7%[5], this falls significantly short of the predetermined target of 95%. If vaccination coverage remains below 95%, the benefits will only extend to the protection of vaccinated individuals, while unvaccinated individuals may serve as reservoirs for viral replication, potentially leading to the resurgence of measles/rubella infections.

Table 3. Analysis of Bivariate Independent Variables on Measles/Rubella Incidence During Outbreak in City of Pariaman

Vaccination History	The Occurrence of Measles/Rubella				Total		P	OR
	Measles/Rubella		Non Measles/Rubella					
	Frekuensi (n)	%	Frekuensi (n)	%	Frekuensi (n)	%		
Unimunized	22	73,3	8	26,7	30	100		
Imunized	22	45,8	26	54,2	48	100	0,032	3,25
Total	44	56,4	34	43,6	78	100		(1,209-8,733)

Based on the chi-square test results, it is noted that there is a significant association between immunization history and measles/rubella occurrence in the city of Pariaman, with a p-value of 0.032 ($p < 0.05$). The odds ratio (OR) of 3.25 (95% CI = 1.209 - 8.733) indicates that individuals without immunization history are at 3.25 times higher risk of contracting measles/rubella compared to immunized individuals.

One of the causes contributing to child mortality in Indonesia, particularly in developing countries, is measles, which exhibits a highly rapid transmission rate. Meanwhile, rubella is a mild acute disease that frequently infects susceptible children and young adults. Rubella infection in pregnant women can lead to serious consequences, including an increased risk of miscarriage or permanent disability in newborns, known as congenital rubella syndrome (CRS). When an individual contracts measles, approximately 90% of individuals who have close contact with measles patients are at risk of transmission if they lack immunity to measles. Immunity can be acquired through measles vaccination or prior measles virus infection[16]. The Impact of Measles and Rubella Infections on Health can persist throughout the lifespan and may result in significant economic losses for individuals, families, and society at large[10].

The Government of the Republic of Indonesia has undertaken preventive measures to address communicable diseases. Minister of Health Regulation No. 12 of 2017 on Immunization Implementation emphasizes the importance of disease prevention through immunization as a means to achieve optimal public health levels. To achieve this, it is crucial to maintain high and equitable immunization coverage throughout Indonesia. This is aimed at preventing outbreaks (Kejadian Luar Biasa/KLB) in specific regions[14]. Currently, the trend of vaccination coverage in Indonesia is showing a downward trajectory, despite concerted governmental efforts to attain the target coverage rate of 95%.

Immunization has several key benefits, including providing specific protection to the individual who is vaccinated, and it also plays a role in forming herd immunity within a community. Herd immunity is achieved when a large proportion of the population is immune to a disease, either through vaccination or prior infection. This makes it more difficult for the disease to spread, and therefore protects individuals who are not vaccinated, such as those who are too young or have medical conditions that contraindicate vaccination. In addition to herd immunity, immunization can also provide cross-protection. This means that vaccinating one group, such as children, can help to limit the spread of disease to other groups, such as adults or the elderly. This helps to protect the entire community.[4]

Based on the data provided by the Pariaman City Health Office in 2022, Pariaman City experienced a Measles Outbreak (MO) phenomenon. Various factors contributed to the occurrence of the MO in Pariaman City, including the persistently low

 DOI: http://dx.doi.org/10.35730/jk.v15i1.1055

coverage of Measles-Rubella (MR) immunization. Specifically, the MR immunization coverage in Pariaman City was reported as 66.4% in 2021 and 81.4% in 2022, both of which fall significantly below the national target of 95%.[5]. The research conducted by Laras Arsy Insani demonstrates a significant relationship between population size and the number of infants not receiving measles immunization with reported measles cases in DKI Jakarta Province in 2018. The correlation coefficient between these variables is 0.855, indicating a very strong association. This implies that as the number of infants not receiving measles immunization increases, the incidence of measles cases also rises in DKI Jakarta Province[11].

Low immunization coverage in Pariaman City is a complex issue with multiple contributing factors. One key factor is low knowledge levels, including a lack of awareness of the importance of immunization. Parents' attitudes and beliefs also play a significant role in low immunization uptake. This issue is compounded by inadequate outreach efforts, which can lead to vaccine hesitancy and refusal. Some parents may have concerns about post-immunization adverse events (AEs), while others may have doubts about the halal status of vaccines. These factors can all influence parents' decisions about whether or not to immunize their children. To address these challenges, it is essential to implement comprehensive interventions that target multiple levels of the socio-ecological model[5]. This aligns with research conducted by Asha Jama et al. in Somalia, indicating that one of the reasons why some parents do not provide immunizations to their children is due to negative vaccine-related rumors. These rumors include fears that vaccination can cause children to lose their ability to speak, uncertainty about the safety of measles and rubella (MR) vaccines. As a result of these rumors, some mothers become hesitant and unwilling to administer vaccinations to their children[9].

The refusal towards MR immunization may stem from inadequate maternal knowledge regarding the benefits of MR immunization. Additionally, negative news or doubtful coverage regarding MR immunization also significantly impacts maternal perceptions of MR immunization[17]. The maternal knowledge significantly influences the administration of MR immunization, as evidenced by the research conducted by Elsa Mathica Naibaho et al., demonstrating a correlation between maternal knowledge and completion of MR immunization[18]. Furthermore, familial support significantly influences the administration of MR vaccination. Based on research conducted by Bella Nuzani, it is known that there is a relationship between family support and the implementation of MR immunization in the working area of the Tegal community health center. Apart from the spouse, mothers also require familial support from parents or in-laws who also hold positive attitudes towards immunization[19].

Various methods have been employed to enhance the socialization regarding the importance of measles immunization in preventing its escalation. A study conducted in West Wisconsin endeavored to adopt one of these approaches by implementing a reminder system. They dispatched reminder letters to families as an intervention. The findings of this study indicate that the measles immunization rate within the research cohort increased from 88.9% to 94.7%.[20]. The added value of non-selective mass measles and rubella vaccination (requiring no prior vaccination status verification) in countries with high routine immunization coverage is being questioned due to the significant financial and personnel costs involved, as well as the potential inefficiencies in reaching children who are under-immunized against measles/rubella.[21].

Based on the evaluation conducted by Haribondhu et al., it is emphasized that the success of vaccination campaigns relies heavily on the completion of several key activities. These encompass thorough planning, adequate budget allocation, effective training, extensive supervision and monitoring. Additionally, pivotal factors also include strong political commitment from the Ministry of Health, efficient service delivery design, workforce commitment in the field of Health, successful efforts in stimulating vaccine demand, as well as adaptive management capabilities and effective partnering abilities in addressing various emerging challenges.[22].

The World Health Organization (WHO) and development partners, in collaboration with member states, need to routinely evaluate ongoing elimination efforts and identify opportunities to accelerate necessary steps while addressing identified barriers. It is evident that the persistently low vaccination coverage and the ongoing emergence of measles and rubella cases indicate significant challenges in the immunization program that must be addressed through a structured approach. Additionally, best

practices successfully implemented in countries that have achieved disease elimination should be adopted and maintained as examples for other nations. This is crucial to ensure that all countries collectively achieve measles and rubella elimination status in the near future and maintain disease-free regions.[23]

CONCLUSION

This study found that immunization history was significantly associated with the outbreak of measles and rubella (MR) in Pariaman City in 2022. The chi-square test showed a p-value of 0.032 ($p < 0.05$), indicating a statistically significant relationship between immunization history and MR occurrence. The odds ratio (OR) of 3.25 (95% CI = 1.209 – 8.733) suggests that individuals with no immunization history were 3.25 times more likely to contract MR compared to those who were immunized. These findings highlight the importance of maintaining high immunization coverage rates to prevent outbreaks of vaccine-preventable diseases such as MR. Furthermore, the study emphasizes the need for targeted interventions to increase immunization uptake among populations with low immunization coverage.

ACKNOWLEDGMENT

The authors would like to thank the Pariaman City Health Department, the study participants, and those who provided feedback on the report.

REFERENCE

[1] World Health Organization., “Measles fact sheet.” doi: (https://www.who.int/news-room/ fact-sheets/detail/measles.

[2] World Health Organization, “Measles - Indonesia,” 2023. Accessed: Aug. 21, 2023. [Online]. Available: https://www.who.int/emergencies/disease-outbreak-news/item/2023-DON462

[3] Badan Pusat Statistik, “Persentase Balita yang Pernah Mendapat Imunisasi Campak (Persen), 2020-2022.” [Online]. Available: https://www.bps.go.id/indicator/30/211/1/persentase-balita-yang-pernah-mendapat-imunisasi-campak.html

[4] Dinas Kesehatan Provinsi Sumatra Barat Tahun 2022, “Profil Kesehatan Sumatra Barat,” Padang, 2023.

[5] Dinas Kesehatan Kota Pariaman, “Profil Kesehatan Kota Pariaman Tahun 2022,” Pariaman, 2023.

[6] K. K. RI, *Petunjuk Teknis Kampanye Imunisasi Meales Rubella (MR)*. Jakarta, 2017.

[7] S. Notoatmodjo, *Promosi Kesehatan dan Perilaku Kesehatan*. Rineka Cipta, 2014.

[8] A. Nasika *et al.*, “Measles Immunity Status og Greek Population After the Outbreak in 2017 - 2018 : Result From a Seroprevalence National Survey,” *MDPI*, vol. 11, no. 1220, 2023.

[9] A. Jama, M. Ali, A. Lindstrand, R. Butler, and A. Kulane, “Perspectives on the Measles, Mumps and Rubella Vaccination among Somali Mothers in Stckholm,” *Int. J. Enviromental Res. ang Public Heal.*, vol. 15, 2018.

[10] A. F. Lubanga *et al.*, “Malawi vaccination drive: An integrated immunization campaign against typoid, measles, rubella, and polio; health benefits and potential chalenges,” *Hum. Vaccin. Immunother.*, vol. 19, no. No 2, 2233397, 2023, [Online]. Available: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10337493/

[11] Laras Arsyi Insani and I. D. Prakoso, “Hubungan Antara Pemberian Imunisasi Campak dengan Kejadian Campak di Provinsi Daerah Khusus Ibukota Jakarta,” *Media Gizi Kesmas Univ. Airlangga*, vol. 11, pp. 130–136, 2022.

[12] S. Notoatmodjo, *Metodologi Penelitian Kesehatan*. Rineka Cipta, 2018.

[13] K. E. Oktaviasari, “Hubungan Imunisasi Campak dengan kejadian Campak di Provinsi Jawa Timur,” *J. Berk. Epidemiol.*, vol. 6, no. 2, pp. 166–173, 2018.

[14] Kementrian Kesehatan RI, *Peraturan Menteri Kesehatan Republik Indonesia Nomor 12 Tentang Penyelenggaraan Imunisasi*. Jakarta, 2017.

 DOI: http://dx.doi.org/10.35730/jk.v15i1.1055

[15] N. A. Juniarti, Firdaus J Kunoli, "Faktor Resiko Kejadian Campak di Dusun Wandu Desa Salubomba ilayah Kerja Puskesmas Donggala," *Promotif*, vol. 6, no. 1, pp. 45–54, 2016.

[16] D. K. K. Pariaman, *Panduan Keagamaan Dalam Penyelanggaraan Imunisasi Measles dan Rubella (MR)*. Pariaman: Dinas Kesehatan Kota Pariaman, 2019.

[17] E. Uki, N. heny Purwati, and T. Sulastri, "Analisis Faktor yang Berhubungan dengan Pemberian Imunisasi Measles Rubella Pada Anak Balita," *J. Ilm. Kesehat. Pers.*, vol. 09 (2), pp. 72–80, 2020.

[18] Elsa Matchica Naibaho and Ernawati, "Hubungan Faktor - Faktor yang Mempengaruhi Kelengkapan Imunisasi Dengan Kepatuhan Imunisasi MR (Measles Rubella) Lanjutan di Wilayah Kerja Puskesmas Air Rami Kabupaten Muko - Muko Bengkulu," *Tarumanagara Med. J.*, vol. 3, no. 2, pp. 304–311, 2021, [Online]. Available: https://journal.untar.ac.id/index.php/tmj/article/view/13721

[19] B. Nuzaini and D. Sayati, "Faktor - Faktor yang Berhubungan Terhadap Pelaksanaan Imunisasi Meales Rubella di Wilayah Kerja Puskesmas Tegal Binangun Palembang Tahun 2019," *J. Bina Husada*, vol. 13, no. No 1, pp. 19–28, 2021, [Online]. Available: https://karya.brin.go.id/id/eprint/17856/1/Jurnal_Bella Nuzaini_STIK Bina Husada Palembang_2021.pdf

[20] S. L. Rosas *et al.*, "Improving Immunization Rates During the 2019 Measles Outbreak," *Heal. J. Prim. care Community*, vol. 13: 1–5, 2022, [Online]. Available: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8841912/

[21] C.Prosperi *et al.*, "Added value of the measles-rubella supplementary immunizatio activity in reaching unvaccinated and under - vaccinated children, a cross-sectional study in five indian districts, 2018 - 2020," *www.elsevier.com/locate/vaccine*, vol. 41, pp. 486–495, 2023, [Online]. Available: https://pubmed.ncbi.nlm.nih.gov/36481106/

[22] H. Sarma *et al.*, "Implementation of the World's largest measles-rubella mass vaccination campaign in Bangladesh: a process evaluation," *BMC Public Health*, vol. 19:925, 2019, [Online]. Available: https://bmcpublichealth.biomedcentral.com/articles/10.1186/s12889-019-7176-4

[23] S. S. Datta *et al.*, "Progress and challenges in measles and rubella elimination in the WHO European Region," *HHS Public Access*, 2019.