


RESEARCH

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The Relationship Between Diarrhea Prevalence and Rotavirus Vaccination Status in Children Under 5 Years Old in Pontianak City

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ABSTRACT

Introduction: Viruses are the main cause of diarrhea in children under 5 years old. Rotavirus is the most common cause of viral diarrhea and causes 41%–58% of cases to be hospitalized because of severe dehydration. WHO recommends rotavirus immunization, which Indonesia has implemented since 2022. This study aims to determine the relationship between rotavirus vaccination status and the incidence of rotavirus diarrhea in children under 5 years old at Dr. Soedarso Regional General Hospital in Pontianak. **Methods:** This observational analytic study used a cross-sectional design and was conducted in the inpatient ward of Dr. Soedarso Regional General Hospital, Pontianak, from July to October 2025. Data on rotavirus vaccination status and the incidence of diarrhea were collected from children under five years old who met the inclusion criteria. Data were processed using Microsoft Excel and SPSS. **Results:** During the study period, 69 cases of diarrhea were recorded, and 27.5% tested positive for rotavirus. A total of 46.3% of patients had been vaccinated against rotavirus. Analysis showed a significant protective association between rotavirus vaccination status and diarrhea among children under five years old (p = 0.039; PR = 0.41). **Conclusion:** This study found a significant association between rotavirus vaccination status and diarrhea incidence.

Keywords: Children under 5 years old, diarrhea, rotavirus, vaccination.

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INTRODUCTION

Diarrhea is an infectious disease characterized by an increase in the water content of stool, with bowel movements occurring more than three times a day.[1] This infectious disease can occur at any stage of life, particularly during early childhood. One in 10 children under 5 years old with diarrhea experiences severe complications that can lead to death. The incidence rate of diarrhea among children under 5 years old in Indonesia is relatively high, reaching 10.2%.[1,2] The 2022 West Kalimantan Health Profile reports that at least 71,264 children under 5 years old suffered from diarrhea, and 1,425 of them died.[3] Viruses are the most common cause of diarrhea in infants; as many as 90% of diarrhea cases are caused by viruses.

Rotavirus is a leading cause of diarrhea in this age group.[4] The Indonesia Rotavirus Surveillance Network (2001–2017) reported that 41% to 58% of infants hospitalized for severe dehydration due to diarrhea were caused by rotavirus infection.[5] Studies conducted in Mexico and Brazil in 2021 reported a 46% reduction in children under 5 years old mortality from diarrhea in Mexico and a 22% reduction in Brazil following the implementation of rotavirus immunization programs.[6]

The WHO recommends rotavirus vaccination for infants as part of national immunization programs in all countries, particularly in those with high mortality rates associated with rotavirus gastroenteritis (RVGE).[6] Indonesia is one of the countries participating in this rotavirus immunization program. The Ministry of Health of the Republic of Indonesia adopted a policy to include the rotavirus vaccine in the immunization schedule in 2022.[6,7] This study aims to determine the relationship between rotavirus vaccination status and the incidence of rotavirus diarrhea among infants at Dr. Soedarso General Hospital in Pontianak.

METHODS

This study used an observational analytical cross-sectional design. The study used consecutive sampling. The independent variable was rotavirus vaccination status, and the dependent variable was the incidence of rotavirus diarrhea among hospitalized children under 5 years old at Dr. Soedarso General Hospital in Pontianak. This study received an ethical review approval letter from Dr. Soedarso General Hospital in Pontianak, reference number 00.9.1/012316/RSUD. The inclusion criteria were children aged 29 days to 59 months and 28 days, hospitalized with diarrhea, and parents or guardians who agreed to participate. Exclusion criteria included parents or guardians who did not know their child's vaccination status. Data on rotavirus vaccination status specifically, whether at least one dose has been administered, was collected from the Maternal and Child Health (MCH) record book or through interviews. Stool testing

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confirmed rotavirus diarrhea cases using the SD Bioline Rotavirus 20T rapid diagnostic test. The sample size was calculated using the Slovin formula (n = N/(1 + N·e²)), where N is the population of children under 5 years old with acute diarrhea in 2024 (75 children) and e is the margin of error (5%), resulting in a minimum sample size of 63. This study added 10% to the minimum sample size to account for invalid data, resulting in a total sample size of 69. Data analysis of the relationships between variables used the chi-square test with a significance level of $p < 0.05$.

Slovin's Formula:

$$\frac{N}{1 + N \cdot e^2}$$

Explanation:
n = sample size
N = population size
e = margin of error = 5%

Based on the formula above, the sample size is calculated as follows:

$$n = \frac{75}{1 + 75 \cdot 0{,}05^2}$$

$$n = \frac{75}{1 + 75 \cdot 0{,}0025^2}$$

$$n = \frac{75}{1{,}1875}$$

$$n = \frac{75}{1 + 0{,}1875}$$

$$n = 63{,}1$$

RESULTS

Characteristics of Diarrhea Patients

Most patients were male (63.8%), and most were children aged 1–5 years (59.4%) **(Table 1).**

Distribution of Rotavirus Infections and Rotavirus Vaccination

A total of 69 samples were collected from patients with acute diarrhea. The test results were predominantly negative, with 50 samples (72.5%) testing negative **(Table 2).** The number of unvaccinated respondents was higher (53,7%) than that of vaccinated respondents **(Table 3)**.

Distribution of Characteristics of Patients with Rotavirus-Induced Diarrhea

Among patients with rotavirus-induced diarrhea, males outnumbered females. There were 11 male patients (57.8%) infected with rotavirus. By age, children aged 1–5 years made up the largest group (63.2%) among patients with rotavirus-induced diarrhea. Regarding vaccination status, 73.7% of patients with rotavirus infection had not been vaccinated against rotavirus **(Table 4).**

Association Between Vaccination and the Incidence of Rotavirus Diarrhea

Analysis of the relationship between variables using the chi-square test yielded a significant result with p value of 0.039, indicating a relationship between rotavirus vaccination status and the incidence of rotavirus diarrhea. The prevalence of rotavirus diarrhea was 15.6% (5/32) among vaccinated children, compared with 37.8 (14/37) among unvaccinated children. The prevalence ratio (PR) was 0.41, indicating that the prevalence of rotavirus diarrhea among vaccinated children was approximately 59% lower than that among unvaccinated children. The odds ratio (OR) was 0.30, indicating that children

Table 1. Distribution of patient characteristics.

Characteristics	Amount (n)	Percentage (%)
Gender		
Male	44	63.8
Female	25	36.2
Age		
Infants (1–11 months)	28	40.6
Children under 5 years old (1–5 years)	41	59.4
Total	**69**	**100**

Table 2. Rotavirus distribution.

Incidence of Diarrhea	Amount (n)	Percentage (%)
Rotavirus Positive	19	27.5
Rotavirus Negative	50	72.5
Total	**69**	**100**

Table 3. Vaccination distribution.

Rotavirus Vaccination	Amount (n)	Percentage (%)
Vaccinated	32	46.3
Unvaccinated	37	53.7
Total	**69**	**100**

Table 4. Distribution of characteristics of patients with Rotavirus infection (n = 19).

Characteristics	Amount (n)	Percentage (%)
Gender		
Male	11	57.8
Female	8	42.2
Age		
Infants (1–11 months)	7	36.8
Children under 5 years old (1–5 years)	12	63.2
Vaccination Status		
Vaccinated	5	26.3
Not vaccinated	14	73.7
Total	**19**	**100**




Table 5. Test of the relationship between diarrhea incidence and vaccination.

Rotavirus Vaccination Status	Diarrhea				*p*-value	PR
	Rotavirus (+)		Non-Rotavirus (-)			
	Amount (n)	Percentage (%)	Amount (n)	Percentage (%)		
Vaccinated	5	15.6	27	84.4	0.039	0.41
Not vaccinated	14	37.8	23	62.2		

who received the rotavirus vaccine had 70% lower odds of developing rotavirus diarrhea compared with unvaccinated children. These findings suggest a protective association between rotavirus vaccination and rotavirus diarrhea **(Table 5).**

DISCUSSION

Of the 69 study samples, the majority were children aged 1–5 years (59.4%) and male (62.9%). This is finding is consistent with the study by Arnisona, *et al*.,[8] in Batam City, which reported more male than female patients with diarrhea. In contrast, a study by Vinandyanata, *et al*.,[9] in Denpasar found more female diarrhea patients than male patients.

Diarrhea can be characterized by factors such as the type of diarrhea and its frequency.[10] In this study, all research samples (100%) consisted of acute diarrhea—defined as diarrhea lasting 1–14 days—and 27.5% of the samples tested positive for rotavirus. Rotavirus infection is primarily influenced by variations in temperature, rainfall, and humidity.[11] These factors play a crucial role in affecting the virus's stability in the environment.[11] A study by Sumi, *et al*.,[11] in India reported a significant increase in rotavirus infections from December through January, with cases declining from March through September. Rotavirus cases are higher at low temperatures. A 2021 study by Amanda, *et al*.,[12] in Sidoarjo also showed that rotavirus infections rose significantly from January through February and declined significantly from July through September. High rainfall, low temperatures, and humidity may play a key role in rotavirus survival.[12]

More respondents in this study were unvaccinated against rotavirus (53.7%) than vaccinated (46.3%). National data from 2010–2015 recorded 4,013 cases of diarrhea during that period; rotavirus infection caused 1,950 cases.[13] Regional data also show relatively high incidence rates in various areas such as Central Java, East Java, and West Java each year.[14] These high incidence rates prompted the government to mandate rotavirus vaccination starting in 2022 in 21 regencies/cities spread across various provinces.[6] Ministry of Health Regulation No. 3 of 2026 requires everyone to get vaccinated to protect children under 5 years old from certain diseases.[13] The vaccine used in the national program is Rotavac, with an efficacy rate of approximately 53.6%.[15] Although the national basic immunization coverage has reached the target of 99.6%.[16] The continued occurrence of diarrhea in vaccinated children indicates the influence of complex factors, including vaccine quality through the cold chain system, Indonesia's vast geographical conditions, and the different method of vaccine administration—administered orally rather than by injection.[16,17] Various external and internal factors also influence the success of vaccination programs. Environmental factors such as inadequate sanitation, limited access to clean water, and high pathogen exposure can increase infection risk even in vaccinated children. In addition, there are still challenges regarding vaccine acceptance in the community due to a lack of parental knowledge, concerns about side effects, exposure to misinformation on social media, and barriers to accessing health facilities.[18]

These barriers also posed challenges in this study, as some patients refused to provide samples because they were concerned about their test results.

The results show a significant association between rotavirus vaccination status and the incidence of rotavirus diarrhea (p = 0.039). Among vaccinated children, 26.3% tested positive for rotavirus, compared with 73.7% among unvaccinated children, indicating a lower prevalence of rotavirus infection in vaccinated children. [10] Therefore, a comprehensive approach is needed to increase vaccination coverage through thorough parent education, strengthening the vaccine distribution system, improving appropriate risk communication, and enhancing environmental sanitation and hygiene to reduce the burden of rotavirus-induced diarrhea in Indonesia.

CONCLUSION

The findings highlight the potential importance of rotavirus vaccination in reducing the burden of rotavirus-associated diarrhea among children under five years old. The significant association between vaccination status and rotavirus diarrhea suggests that vaccination may play an important role in preventing rotavirus infection. These findings emphasize the need to increase public awareness of the benefits of rotavirus vaccination, improve access to routine immunization services, and encourage parents to complete their children's vaccination schedules. Future studies involving larger populations and prospective designs are recommended to evaluate the protective effectiveness of rotavirus vaccination further. Continued surveillance of rotavirus infections and vaccination coverage is also essential to assess immunization program performance and guide future public health strategies.

DECLARATIONS

Ethics Statement

This study was conducted in accordance with applicable ethical principles for research involving human participants. The Research Ethics Committee of Dr. Soedarso General Hospital, Pontianak, Indonesia, approved the study (Approval No. 00.9.1/012316/RSUD). Written informed consent was obtained from the parents or legal guardians of all participating children before data collection. Participation was voluntary, and the confidentiality of all collected data was maintained. The data were used solely for research purposes.

Consent for Publication

Not applicable. This study does not include identifiable personal information, identifiable images, or other details that could reveal individual participants' identities.




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Author Contributions
Rain Gavin Ganendra (RGG) contributed to sample collection, laboratory examination, data analysis, and manuscript writing. Diana Natalia (DN) contributed to the study conception, laboratory examination, and manuscript writing. Desriani Lestari (DL) contributed to diagnosis, data collection, and manuscript writing. Willy Handoko (WH) and Ridha Ulfah (RU) contributed to manuscript writing. All authors reviewed and approved the final version of the manuscript.

Conflict of Interest
The authors declare no financial or non-financial conflicts of interest related to this study.

Declaration on the Use of Artificial Intelligence (AI)
The authors used ChatGPT (OpenAI) to assist with manuscript drafting and language editing. The authors critically reviewed all AI-generated suggestions, revised them where necessary, and verified them. All authors approved the final version of the manuscript and take full responsibility for its content.

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REFERENCES

1. Devana ND, Rizkia CP. Peran vaksin rotavirus terhadap penurunan jumlah kasus dan lama rawat anak dengan diare. Cermin Dunia Kedokt. 2025;52(9):615–8. https://doi.org/10.55175/cdk.v52i9.1609.
2. Kementerian Kesehatan RI. Rencana aksi nasional penanggulangan pneumonia dan diare 2023–2030 [Internet]. 2023. Available from: https://www.scribd.com/document/722803751/NAPPD-2023-2030-Compressed.
3. Dinas Kesehatan. Profil kesehatan Provinsi Kalimantan Barat tahun 2020 [Internet]. 2022 [cited 2024 Dec 21]. Available from: https://datacloud.kalbarprov.go.id/index.php/s/PLjw5737Xy5yz4P#pdfviewer.
4. Viegelmann GC, Dorji J, Guo X, Lim HY. Approach to diarrhoeal disorders in children. Singapore Med J. 2021;62(12):623. https://doi.org/10.11622/smedj.2021234.
5. Unicef. Pencanangan nasional perluasan imunisasi rotavirus (RV) [Internet]. 2023 [cited 2024 Dec 22]. Available from: https://www.unicef.org/indonesia/id/kesehatan/siaran-pers/pencanangan-nasional-perluasan-imunisasi-rotavirus-rv.
6. Kementerian Kesehatan Republik Indonesia. Buku petunjuk teknis pemberian imunisasi rotavirus. Jakarta: Kementerian Kesehatan; 2022. p. 1–43.
7. Kementerian Kesehatan Republik Indonesia. Kemenkes tambahkan 4 jenis vaksin baru untuk perlindungan anak Indonesia – sehat negeriku [Internet]. Jakarta: Kementerian Kesehatan; 2023 Mar [cited 2024 Dec 22]. Available from: https://sehatnegeriku.kemkes.go.id/baca/umum/20230327/5942664/kemenkes-tambahkan-4-jenis-vaksin-baru-untuk-perlindungan-anak-indonesia/.
8. Br Sinaga AR, Roza N, Huzaima H. Hubungan vaksinasi rotavirus dengan kejadian diare pada bayi di wilayah kerja UPT Puskesmas Sei Panas Kota Batam tahun 2024. J Riset Rumpun Ilmu Kedokt. 2025;4(3):335–47. https://doi.org/10.55606/jurrike.v4i3.6993.
9. Vinandyanata IMD, Mahayani NPA, Paramasatiari AAAL. Hubungan vaksinasi rotavirus pentavalent dengan kejadian diare pada anak usia 6–24 bulan di Denpasar. Aesculapius Med J. 2021;1(1):20–6.
10. Amin, LZ. Tatalaksana diare akut. Cermin Dunia Kedokt. 2015;42(7):504–8.
11. Sumi A, Rajendran K, Ramamurthy T, Krishnan T, Nair GB, Harigane K, et al. Effect of temperature, relative humidity and rainfall on rotavirus infections in Kolkata, India. Epidemiol Infect. 2013;141(8):1652–61. https://doi.org/10.1017/s0950268812002208.
12. Amanda SV, Yamani LN, Dinana Z, Maharani AT, Astutik E, Noerfitri N. Correlation between climate variations and rotavirus diarrhea in under-five children in Sidoarjo District year 2016–2019. J Kes Lingkungan. 2023;15(3):174–82. https://doi.org/10.20473/jkl.v15i3.2023.174-182.
13. Putri E, Arriza N, Erviana L. Promosi kesehatan untuk meningkatkan pengetahuan tentang pentingnya imunisasi dasar pada bayi usia 0–9 bulan di PMB Windiyati tahun 2024. Kebidanan Komunitas Pengabdian Kepada Masyarakat. 2025;08:36–41.
14. Lestari FB, Vongpunsawad S, Wanlapakorn N, Poovorawan Y. Rotavirus infection in children in Southeast Asia 2008–2018: disease burden, genotype distribution, seasonality, and vaccination. J Biomed Sci. 2020;27(1):1–9. https://doi.org/10.1186/s12929-020-00649-8.
15. Aman AT, Patriani A, Mawarti Y. Efficacy of rotavirus vaccines in Indonesia: a review of genotype distribution and impact. Narra J. 2025;5(1):e1681. https://doi.org/10.52225/narra.v5i1.1681.
16. Wihatyani K, Isnaini N, Ermasari A. Analysis of maternal knowledge and attitudes towards the completeness of rotavirus immunization in 5-month-old children. JKM (J Kebidanan Malahayati). 2025;11(4):284–90. http://doi.org/10.33024/jkm.v11i4.16515.
17. World Health Organization. Rotavirus vaccines: WHO position paper – July 2021 [Internet]. Geneva: World Health Organization; 2021. Available from: https://www.who.int/publications/i/item/WHO-WER9628.
18. Susanty RR, Nasution MA, Harahap F, Edi S, Sipahutar H. Pandangan masyarakat terhadap imunisasi pada anak usia 0–12 bulan di wilayah kerja Aceh Singkil. Jurnal Bioshell. 2025;14(2):170–8. https://doi.org/10.56013/bio.v14i2.3995.