

Host Determinants of Diarrhea Incidence among Toddlers in Indonesia: A Systematic Review

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ABSTRACT

Background: Toddler diarrhea is a major Indonesian health concern. Toddler diarrhea rates differ in the 2021 SSGI data. West Sulawesi, NTB, and Maluku have the most diarrhea. This study investigates the causes of Indonesian toddler diarrhea.

Objectives: This research is intended to systematically analyze host-related determinants that contribute to the occurrence of diarrhea in Indonesian toddlers from 2021 to 2025.

Methods: PRISMA 2020 guided systematic reviews. Google Scholar, ScienceDirect, and PubMed provided data. Eight 2021–2025 studies examined Indonesian toddler diarrhea risk variables. Newcastle-Ottawa Scale and internal validation questions rated quality.

Results: From the screening process, eight studies were determined to satisfy the inclusion criteria. The synthesis of these studies showed that several host characteristics, including toddler's age, practice of exclusive breastfeeding, and immunization completeness, show a meaningful association with diarrhea prevalence among young children in Indonesia.

Conclusion: Age, exclusive breastfeeding, and immunization status significantly affected Indonesian toddler diarrhea incidence, although nutritional condition and gender did not.

Keywords: Diarrhea, Disease, Host, Infectious, Toddler

INTRODUCTION

Diarrhea is frequent in low-income countries such as Indonesia. This health issue persists despite ongoing public health efforts. Everyone may experience diarrhea, but infants and toddlers have a higher risk of severe symptoms and mortality due to their immature immune systems. The Indonesian Ministry of Health's Basic Health Research (*Riskesmas*) found significant diarrhea rates among children under 5. Internationally, diarrhea-related infant mortality rose from 2015 to

2017. In 2015, diarrhea killed 525,000 of 1.7 million children globally (WHO, 2017). Furthermore, WHO (2024) reported that 443,832 toddlers died from diarrhea in 2023, making it the second greatest cause of mortality for children under five globally. Troeger et al. (2018) found that children under three years old in low-income countries experience diarrhea three times per year.

Indonesian child diarrhea rates vary annually. *Riskesmas* 2017 statistics showed a 40.90% decrease in childhood diarrhea. The highest

frequency (11.5%) was observed in the 1–4 year age group in 2018, when cases increased 62.93%. The 2021 Indonesian Nutrition Status Survey found 9.8% of toddlers had diarrhea. Diarrhea remains one of the primary causes of child mortality in Indonesia. The leading cause of death for children aged 12–59 months in 2021 was diarrhea (10.3%), an increase from 4.55% in 2020 (Kementerian Kesehatan RI, 2022). According to Adha *et al.* (2021), the high incidence of diarrhea outbreaks (KLB) in Indonesia has not yet been fully addressed, with toddlers bearing the greatest burden.

The epidemiological triangle says that pathogens, hosts, and environments cause diarrhea (Syadat *et al.*, 2022). Toddlers serve as hosts for pathogens (Sidabutar, 2020), and their underdeveloped immune systems render them vulnerable. Factors that increase this vulnerability include age, gender, nutritional condition, exclusive breastfeeding, immunization status, and malabsorption (Fauzi & Sari, 2020). Research by Maulida, Yanti, Aprianti, & Fathurrahman (2022) observed that children lacking basic vaccines had a 4.75 times higher risk of diarrhea.

This study examines host-related factors of diarrhea among Indonesian toddlers from 2021 to 2025. The study also emphasizes host factors as primary contributors to diarrhea. We review relevant academic literature to better understand host factors of diarrhea in toddlers. This study may assist policymakers and others stakeholders in improving prevention and management.

METHODS

Study Design

This research employed a Systematic Literature Review (SLR). This SLR method comprises the evaluation and selection of articles using the guidelines proposed by Triandini *et al.* (2019). This comprehensive review followed the PRISMA 2020 guidelines. PRISMA, a flowchart-based and evidence-based method, helps reviewers conduct systematic literature reviews through the stages of identification, screening, eligibility, and inclusion.

Eligibility Criteria

This study included research articles published between 2021 and 2025, written in either Indonesian or English, and conducted in Indonesia. The selected studies focused on toddler characteristics, including age, gender, nutritional condition, exclusive breastfeeding, immunization status, and malabsorption, as well as the incidence of diarrhea among toddlers. Articles published before 2020, full texts that were inaccessible, duplicate or irrelevant sources, and those requiring payment for access were excluded from the analysis.

Search Process

The literature search employed the terms faktor determinan, kejadian diare, balita, and Indonesia, corresponding to (“determinant factors”) AND (“incidence of diarrhea”) AND (“toddlers”) AND (“Indonesia”). The database search was conducted on March 10, 2025, to identify studies that met the inclusion criteria. The Newcastle–Ottawa Scale (NOS) was applied to evaluate the methodological quality of non-randomized research, focusing on the selection process of study participants, the comparability of the groups being analyzed, and the methods used to determine exposure or outcomes.

Quality Assessment

The quality assessment process was conducted to guarantee the dependability and accuracy of the data utilized in this research. To determine the quality of the data collected. To determine whether the data collected is of high quality or not, the following questions were evaluated:

QA1 : Were the journals/articles used in this study published in 2021 - 2025?

QA2 : Does the journal/article list the location of the research conducted in Indonesia?

QA3 : Does the journal/article list host factors that may influence the incidence of diarrhea in toddlers in Indonesia??

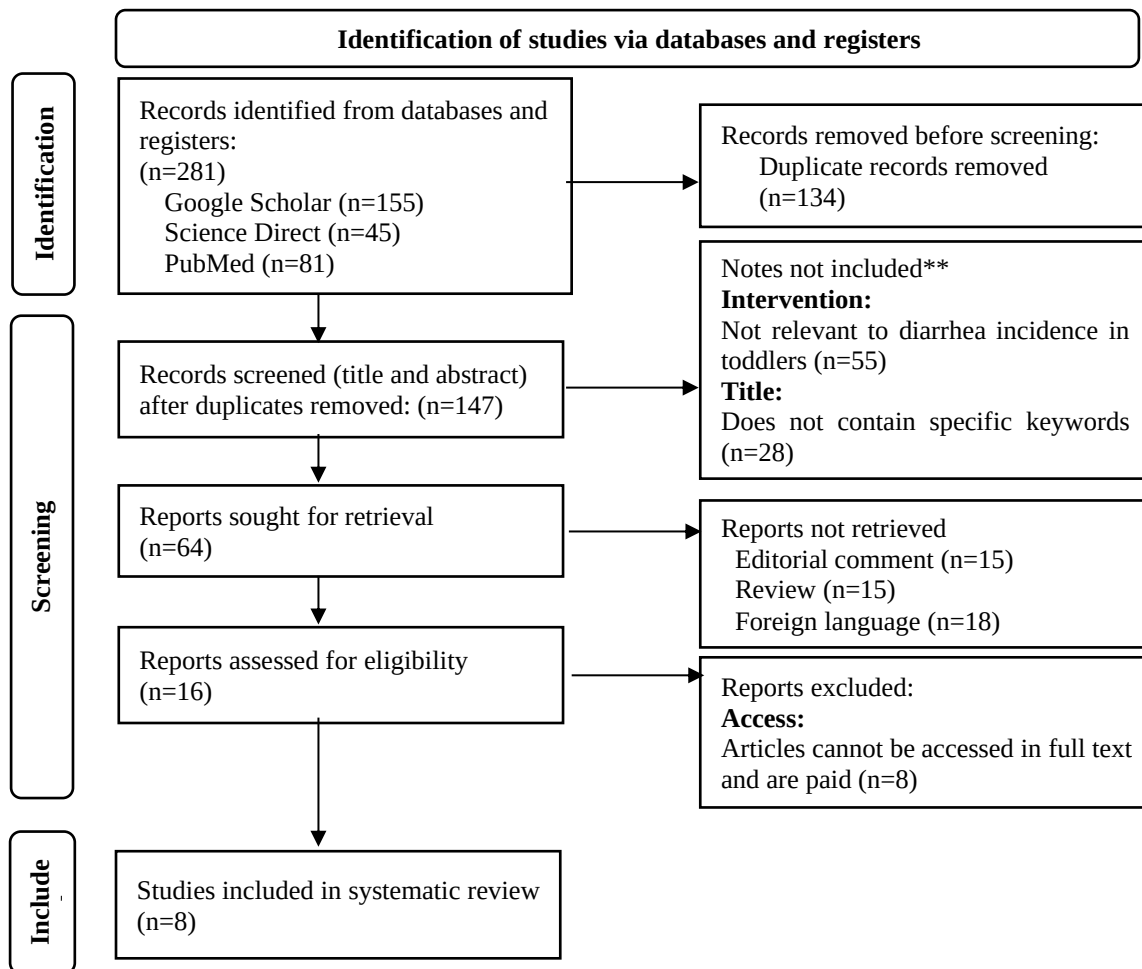


Figure 1. PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) Flow Diagram for Study Selection

RESULT AND DISCUSSION

Quality Assessment Results

A total of eight articles were included after being evaluated according to the established inclusion and exclusion criteria. Eligible studies were published between 2021 and 2025 and

investigated host-related determinants of diarrhea among Indonesian toddlers. Host factors refer to child-specific characteristics such as age, sex, nutritional status, exclusive breastfeeding, and immunization status. The quality assessment outcomes for the included articles are shown below.

Table 1. Literature Data Collection and Quality Assessment

No	Title, Author, Year	Research Design	Quality Assessment			Results
			QA1	QA2	QA3	
1.	Title: Determinants of Diarrhea Incidence Among Toddlers in the Paal V Health Center Service Area, 2024 Author & Year: Fitri <i>et al.</i> , (2025)	This research employed a quantitative design with a cross-sectional design was applied in this study. It included 167 mothers of toddlers recruited through purposive sampling. Data were gathered using a structured questionnaire and an observation checklist. The variables examined included handwashing behavior (CTPS), exclusive breastfeeding practices, how often toddlers attend integrated health posts, the employment status of	Yes	Yes	Yes	Accepted

No	Title, Author, Year	Research Design	Quality Assessment			Results
			QA1	QA2	QA3	
		mothers, access to safe water sources, and the availability of adequate latrines.				
2.	Title: Analysis of Diarrhea Risk Factors Among Toddlers in the Gading Community Health Center Service Area, Surabaya City Author & Year: Perwitasari <i>et al.</i> , (2024)	This research applied a quantitative analytical approach with a cross-sectional design. The study population consisted of mothers with toddlers aged 0–59 months who resided within the working area of the Gading Health Center and had participated in health examinations. A total of 125 respondents were obtained using a consecutive sampling technique. A questionnaire focused on variables such as exclusive breastfeeding, knowledge of diarrhea, food and beverage sanitation hygiene, and handwashing practices was used for data collection. The collected data were analyzed using the chi-square test.	Yes	Yes	Yes	Accepted
3.	Title: Incidence of Diarrhea in Toddlers and Its Risk Factors Author & Year: Oktavianisya, Yasin and Aliftitah, (2023)	This research employed an analytical design using a case control approach. The research population consisted of mothers with toddlers aged 1–5 years who experienced diarrhea within the working area of the Gading Community Health Center, Sumenep. The case group comprised 83 mothers whose children aged 1–5 years had diarrhea, while the control group included 83 mothers whose children in the same age range did not experience diarrhea. Participants were chosen using a simple random sampling method, and data were obtained through a structured questionnaire. The data were analyzed using univariate, bivariate (chi-square), and multivariate analyses with logistic regression testing.	Yes	Yes	Yes	Accepted
4.	Title: Determinants of Diarrhea Incidence Among Toddlers at the Jati Bening Community Health Center, Bekasi, in 2023 Author & Year: Wulandari, (2024)	This research applied a cross-sectional design and involved a total of 66 respondents as the research sample. Total sampling was used in the sampling procedure. Chi-square was used for univariate and bivariate analysis.	Yes	Yes	Yes	Accepted
5.	Title: Association of Intrinsic and Extrinsic Factors with	This research applied a quantitative method with an observational approach utilizing a cross-sectional design. The total population	Yes	Yes	Yes	Accepted

No	Title, Author, Year	Research Design	Quality Assessment			Results
			QA1	QA2	QA3	
	Diarrhea Incidence Among Toddlers in Noelbaki Village District Author & Year: Kenda, Sahdan and Sir, (2022)	consisted of 210 individuals, from which a sample of 67 respondents was selected. Data analysis was performed using the chi-square test with a significance level set at 0.05.				
6.	Title: Analysis of Diarrhea Risk Factors Among Toddlers in the Pakuan Baru Bota Community Health Center Service Area, Jambi Author & Year: Fitriani, Darmawan and Puspasari, (2021)	This research employed a case-control design and was conducted at the Pakuan Baru Community Health Center in Jambi. The study took place from August to November 2020 and involved 100 children under two years old, consisting of 50 cases with diarrhea and 50 controls without diarrhea. Data on potential risk factors were collected through interviews using a structured questionnaire.	Yes	Yes	Yes	Accepted
7.	Title: Factors Associated with Diarrhea in Toddlers Author & Year: Maulida and Atzmardina, (2022)	This research adopted an analytical cross-sectional design with a total sample of 192 participants. Samples were obtained through a non-probability consecutive sampling method. Data collection was carried out through interviews with mothers of toddlers, making the responses reliant on participants self-reports. The chi-square test was employed for statistical analysis.	Yes	Yes	Yes	Accepted
8.	Title: Association Between Nutritional Status and Diarrhea Among Toddlers Aged 24–59 Months in the Setu 1 Community Health Center Service Area Author & Year: Tiasafitir et al., (2022)	This study employed an observational method with a cross-sectional design. A total of 100 participants were recruited using purposive sampling. Data collection was carried out through structured questionnaires and analyzed using the chi-square test.	Yes	Yes	Yes	Accepted

A total of eight studies published between 2021 and 2025 were reviewed to identify host-related determinants of diarrhea among toddlers in Indonesia. All studies met the National Institutes of Health (NIH) quality assessment criteria (QA1–QA3), indicating adequate methodological quality, an appropriate study design, and clarity in variable measurement. Consequently, all articles were accepted for synthesis. Most studies employed a cross-sectional design, with a few adopting case-control approaches. Sample sizes ranged from 50 to

over 190 toddlers, generally drawn from community health centers (*Puskesmas*) across various Indonesian cities, such as Jambi, Surabaya, Bekasi, and Tangerang.

Relationship Between Toddler Age and Diarrhea Incidence

Table 2 presents two research articles examining the association between toddler age and the incidence of diarrhea. One study reported a p -value < 0.05, suggesting a statistically significant

relationship between toddler age and diarrhea occurrence. In contrast, the other study obtained a $p\text{-value} > 0.05$, indicating no significant association between toddler age and diarrhea incidence among toddlers. Both studies, however, consistently showed that the majority of diarrhea cases occurred in children younger than 36 months.

These findings align with the WHO (2023) report, which identified children aged 6–24 months as being at the highest risk for diarrhea and its complications. This increased vulnerability is attributed to the immature development of the immune system during this critical window. According to Ugboke *et al.* (2020), toddlers are especially prone to infections from pathogens such as *Escherichia coli*, Rotavirus, Shigella, and Salmonella. Additionally, the toddler's digestive system is still underdeveloped during the first two years of life. For example, gastric acid secretion is not yet optimal at birth and takes several months to reach a pH level (<4) sufficient to kill ingested pathogens (Nurul Awalia *et al.*, 2023).

The introduction of complementary feeding during this period further increases the risk of exposure to contaminated food or water, especially when hygiene practices are inadequate. This phase, often referred to as the "weaning period," coincides with a drop in passive immunity derived from the mother and the incomplete development of active immunity (Simon *et al.*, 2015). Research by Rahmat *et al.* (2023) also reported higher diarrhea incidence and associated growth impairments (e.g., stunting) among children younger than three years.

In addition, toddlers who consume the breast milk substitute have a higher risk of exposure to unhygienic food or drinks, which also increases the possibility of diarrhea. The exposure can also be found on contaminated floors, toys, or food, being one of the main entry routes for diarrhea-causing agents. At this ages, toddlers exhibit developing behaviour that involves more active exploration of their environment and more frequent play in areas that may be contaminated with bacteria, especially diarrhea-causing agents.

Table 2. Relationship between Toddler Age and the Incidence of Diarrhea in Toddlers

No	Author, Year	Research Title	p-value	OR
1.	Fitriani, Darmawan and Puspasari, (2021)	Analysis of Diarrhea Risk Factors Among Toddlers in the Pakuan Baru Bota Community Health Center Service Area, Jambi	0.000	-
2.	Tiasafitir <i>et al.</i> , (2022)	Association Between Nutritional Condition and Diarrhea Among Toddlers Aged 24–59 Months in the Setu 1 Community Health Center Service Area	0.231	-

Relationship Between Exclusive Breastfeeding with Toddlers Diarrhea Incidence

Table 3 indicates that seven studies reported a $p\text{-value} < 0.05$, indicating a clear association between exclusive breastfeeding and diarrhea occurrence in toddlers. The highest reported Odds Ratio (OR) of 4.00 illustrates a strong relationship between the length of exclusive breastfeeding and the likelihood of developing diarrhea. Toddlers who were exclusively breastfed for less than six months had a fourfold higher likelihood of developing diarrhea compared to those who received exclusive breastfeeding for the full six-month period.

Perwitasari *et al.* (2024) reported that most infants who did not receive exclusive breastfeeding were found to develop diarrhea. This result aligns with the findings of Wulandari (2024), who observed that children lacking exclusive breastfeeding had a fourfold higher likelihood of experiencing diarrhea. Breast milk, particularly colostrum, serves as a critical source of immune protection, as it contains antibodies, enzymes, and immune cells that strengthen the infant's defense system. These bioactive components play a key role in enhancing

immunity, especially in preventing gastrointestinal infections (Zheng *et al.*, 2022).

Secretory immunoglobulin A (sIgA) covers the intestinal mucosal membrane and prevents infections from adhering (Pietrzak *et al.*, 2020). Lactoferrin and lysozyme inhibit diarrhea-causing *Escherichia coli*, Shigella, and Salmonella. Breast milk increases gut microbiota such as *Lactobacillus* and *Bifidobacteria*, strengthening gut defenses (Conesa *et al.*, 2023). When newborns are not exclusively breastfed, they may be given contaminated food or fluids. Their digestive and immunological systems are still growing, so early exposure raises the risk of illnesses, notably diarrhea.

Generally, toddlers who are not exclusively breastfed for the first 6 months will begin receiving additional foods or fluids prematurely. At this age, a baby's digestive system is still highly susceptible to infection, and complementary foods are often not prepared to optimal hygiene standards. As a result, babies are easily exposed to microorganisms such as bacteria or viruses from contaminated food, water, or eating utensils, which can trigger diarrhea.

Table 3. Relationship between Exclusive Breastfeeding and the Incidence of Diarrhea in Toddlers

No	Author, Year	Research Title	p-value	OR
1.	Fitri <i>et al.</i> , (2025)	Determinants of Diarrhea Incidence Among Toddlers in the Paal V Health Center Service Area, 2024	0.016	2.29
2.	Perwitasari <i>et al.</i> , (2024)	Analysis of Risk Factors for Diarrhea in Toddlers in the Work Area of the Gading Community Health Center, Surabaya City	0.005	-
3.	Oktavianisya, Yasin and Aliftitah, (2023)	Incidence of Diarrhea in Toddlers and Its Risk Factors	0.004	2.518
4.	Wulandari, (2024)	Determinants of Diarrhea Incidence Among Toddlers at the Jati Bening Community Health Center, Bekasi, in 2023	0.000	4.00
5.	Kenda, Sahdan and Sir, (2022)	Association of Intrinsic and Extrinsic Factors with Diarrhea Incidence Among Toddlers in Noelbaki Village District	0.005	-
6.	Fitriani, Darmawan and Puspasari, (2021)	Analysis of Diarrhea Risk Factors Among Toddlers in the Pakuan Baru Bota Community Health Center Service Area, Jambi	0.004	-
7.	N. Maulida & Atzmardina, (2022)	Factors Associated with Diarrhea in Toddlers	0.001	-

Relationship Between Immunization Status with Toddlers Diarrhea Incident

Table 4 indicates that one research article reported a $p\text{-value} < 0.05$, showing that immunization status is closely related to the likelihood of diarrhea among toddlers. The World Health Organization (WHO) and UNICEF emphasize several essential strategies to lower the prevalence of diarrhea in young children. These strategies include ensuring access to safe water and proper sanitation, providing vitamin A supplementation, promoting exclusive breastfeeding, and administering key immunizations, particularly for measles and rotavirus (WHO, 2023). Immunization is essential for building immunity and protecting children from infections that can lead to diarrhea. For instance, the measles vaccine indirectly helps reduce diarrhea risk. Measles can cause immune suppression, which increases a child's vulnerability to other infections, including diarrhea. Studies have shown that diarrhea related to measles tends to be more severe and prolonged (Rini, 2021, Oktariana *et al.* 2023). Furthermore, rotavirus immunization is particularly effective in preventing viral diarrhea, which is a leading cause of severe diarrhea and dehydration in children under five. Children who have not received

rotavirus vaccination are at significantly higher risk of developing acute gastroenteritis (Dhalaria *et al.*, 2023).

According to the findings presented by Widianteri *et al.* (2022), rotavirus vaccination in toddlers had a significant relationship with the occurrence of diarrhea and served as a protective factor. Immunization functions to develop the body's defense against specific infectious diseases. A child who is immune to one illness does not automatically gain protection from other diseases. Essentially, immunization is a preventive measure aimed at stimulating or enhancing an individual's immune response to a particular pathogen so that when exposed, the person either does not become ill or only experiences mild symptoms (Darmin *et al.*, 2023). The association between immunization status and diarrhea incidence in toddlers can be understood through the way vaccines function. The vaccines used in the immunization process can be microorganisms that have been killed or weakened. Vaccination activates the body's immune system to generate targeted defenses against specific pathogens, including those responsible for causing diarrhea.

Table 4. Relationship between Immunization Status and the Incidence of Diarrhea in Toddlers

No	Author, Year	Research Title	p-value	OR
1.	Fitriani, Darmawan and Puspasari, (2021)	Analysis of Diarrhea Risk Factors Among Toddlers in the Pakuan Baru Bota Community Health Center Service Area, Jambi	0.012	-

Relationship Between Nutrition Status with Toddlers Diarrhea Incident

Table 5 presents two studies that explored the association between toddler's nutritional condition and diarrhea incidence. Both studies found no meaningful correlation in statistical terms ($p\text{-value} > 0.05$), indicating that nutritional status might not have a direct effect on the probability of diarrhea among toddlers. In both studies, the majority of toddlers had good nutritional status, yet still experienced episodes of diarrhea. Proper nutrition is important for overall health, but it may not prevent diarrhea if sanitation or water are lacking. Despite adequate nutrition, Kenda, Sahdan, and Sir (2022) and Tiasafitir et al. (2022) found that diarrhea rates were high.

Although these studies indicate no direct effect, the relationship between nutrition and diarrhea are bidirectional. Malnutrition lowers immunity and gut integrity, increasing infection risk.

Malnutrition may results from frequent diarrhea, which limits nutrient absorption, raises metabolic demands, and causes loss of appetite. According to WHO (2023) and UNICEF (2022), this vicious cycle between diarrhea and malnutrition continues to cause illness and death among children under five years old in low-and middle-income countries, including Indonesia.

Diarrhea may harm nutritional status even when nutritional status does not predict its occurrence. In vulnerable age groups, frequent or chronic diarrhea may reduce nutrient decrease appetite, and lead to weight loss or stunting (Rahmat et al., 2023). Inflammation and intestinal lining damage reduce vitamin, mineral, and calorie absorption during diarrhea (Lipinwati, 2022). Therefore, diarrhea is more likely to induce poor nutritional status than to result from it. Poor sanitation may still cause diarrhea in well-nourished children.

Table 5. Relationship between Nutritional Status and the Incidence of Diarrhea in Toddlers

No	Author, Year	Research Title	p-value	OR
1.	Kenda, Sahdan and Sir, (2022)	Association Between Intrinsic and Extrinsic Factors and Diarrhea Incidence Among Toddlers in Noelbaki Village District	0.234	-
2.	Tiasafitir et al., (2022)	Association Between Nutritional Status and Diarrhea Among Toddlers Aged 24–59 Months in the Setu 1 Community Health Center Service Area	0.080	-

Relationship Between Gender with Toddlers Diarrhea Incident

Table 6 presents one study by Fitriani, Darmawan, and Puspasari (2021), examining the association between toddler gender and diarrhea incidence. The results ($p=0.648$; $OR=0.812$) indicates no statistically significant relationship, suggesting that gender alone does not influence the risk of diarrhea. Both male and female toddlers share similar levels of immunological vulnerability during early childhood because the immune system is still

developing regardless of sex (Sitopu et al., 2021). Susceptibility to diarrhea is therefore more closely linked to immune maturity, hygiene behavior, and environmental exposure than to biological sex. Although some studies, such as Ayu et al. (2023) have reported slightly higher diarrhea rates among boys, possibly due to behavioral factors such as greater outdoor activity, these differences remain inconsistent and statistically insignificant. Thus, gender is not considered a direct or independent determinant of diarrhea incidence among toddlers.

Tabel 6. Relationship Between Gender with Toddlers Diarrhea Incident

No	Author, Year	Research Title	p-value	OR
1.	Fitriani, Darmawan and Puspasari, (2021)	Analysis of Diarrhea Risk Factors Among Toddlers in the Pakuan Baru Bota Community Health Center Working Area, Jambi	0.648	0.812

This study has the strength of using a systematic review approach guided by the PRISMA 2020 framework, ensuring a transparent, structured selection of relevant literature with quality assessment using the Newcastle-Ottawa Scale. It provides valuable insights into key host factors such as age, exclusive breastfeeding, and immunization

status that have played a significant role in shaping diarrhea incidence among toddlers in Indonesia. Despite these contributions, the review is constrained by the small number of studies included, the heavy reliance on cross-sectional designs that prevent conclusions about causality, and the limited

exploration of environmental and socioeconomic influences that could also affect diarrhea risk.

CONCLUSION

This review summarizes eight studies published between 2021 and 2025 that examined the host-related determinants of diarrhea in Indonesian toddlers. The host-related variables assessed consisted of toddler age, gender, nutritional status, history of exclusive breastfeeding, and immunization status. Among these variables, age, exclusive breastfeeding, and immunization status were found to have meaningful associations with diarrhea cases in toddlers in Indonesia, whereas nutritional status and gender did not exhibit a significant link to diarrhea incidence.

While these factors contribute to overall child health, they do not appear to directly determine diarrhea risk. The findings highlight the necessity of implementing early health interventions. Encouraging exclusive breastfeeding, achieving full immunization coverage, and sustaining maternal and child health programs are vital measures to decrease diarrhea-related morbidity and mortality. Furthermore, enhancing public health literacy and ensuring equitable access to preventive healthcare should be key priorities to effectively reduce the burden of diarrhea among young children in Indonesia.

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Conflict of Interest and Funding Disclosure

None.

Author Contributions

IU: writing-review, editing, analysis and interpretation of result; ASI: conceptualization, data collection, analysis and interpretation of result; KSL: Supervision.

REFERENCES

- Adha, N., Izza, F. N., Riyantiasis, E., Pasaribu, A. Z., & Amalia, R. (2021). Pengaruh Kebiasaan Mencuci Tangan Terhadap Kasus Diare pada Siswa Sekolah Dasar: A Systematic Review. *Jurnal Kesehatan Tambusai*, 2(2). <https://doi.org/10.31004/jkt.v2i2.1842>
- Ayu, I., Pradnya, P., Agung, A., Lila, A., Agung, A., & Lely, O. (2023). Karakteristik Pasien Diare

Anak Umur 2 - 5 Tahun di Rumah Sakit Umum Daerah Wangaya , Denpasar Berdasarkan data kesehatan Kota Denpasar. *Aesculapius Medical Journal*, 3(2). <https://doi.org/10.22225/amj.3.2.2023.180-187>

- Conesa, C., Bellés, A., Grasa, L., & Sánchez, L. (2023). The Role of Lactoferrin in Intestinal Health. In *Pharmaceutics* (Vol. 15, Issue 6). <https://doi.org/10.3390/pharmaceutics15061569>
- Darmin, Rumaf, F., Ningsih, S. R., Mongilong, R., Goma, M. A. D., & Anggaria, A. Della. (2023). Pentingnya Imunisasi Dasar Lengkap Pada Bayi dan Balita. *Jurnal Pengabdian Masyarakat Mapalus*, 1(2). <https://ejournal.stikesgunungmaria.ac.id/index.php/jpmm/article/view/37>
- Dhalaria, P., Kapur, S., Singh, A. K., Verma, A., Priyadarshini, P., & Taneja, G. (2023). Potential impact of rotavirus vaccination on reduction of childhood diarrheal disease in India: An analysis of National Family Health Survey-5. *Vaccine*, X, 14. <https://doi.org/10.1016/j.jvacx.2023.100319>
- FAUZI, Y., & SARI, F. M. (2020). Analisis Determinan Kejadian Diare Pada Balita di Wilayah Kerja Puskesmas Nusa Indah Kota Bengkulu. *Journal of Nursing and Public Health*, 8(2). <https://doi.org/10.37676/jnph.v8i2.1206>
- Fitri, W. D., Fitri, A., Rahmat, A. A., & Nasution, H. S. (2025). Determinants of Diarrhea Incidence in Toddlers in the Work Area Paal V Health Center 2024. *International Journal of Medicine and Health*, 4(March), 86–100. <https://doi.org/10.55606/ijmh.v4i1.5612>
- Fitriani, N., Darmawan, A., & Puspasari, A. (2021). Analisis Faktor Risiko Terjadinya Diare Pada Balita Di Wilayah Kerja Puskesmas Pakuan Baru Kota Jambi. *Medical Dedication (Medic): Jurnal Pengabdian Kepada Masyarakat FKIK UNJA*, 4(1), 154–164. <https://doi.org/10.22437/medicaldedication.v4i1.13472>
- Kementerian Kesehatan RI. (2022). Rencana Aksi Program Pencegahan Dan Pengendalian Penyakit Tahun 2020-2024. In *Rencana AKSI Program P2P* (Vol. 2022).
- Kenda, S. M., Sahdan, M., & Sir, A. B. (2022). Relationship of Intrinsic and Extrinsic Factors to The Incidence of Diarrhea in Toddlers Noelbaki Village District. *Journal of Community Health*, 4(4). <https://doi.org/10.35508/ljch.v4i4.5023>
- Lipinwati, L. (2022). Inflamasi Bowel Disease. *Electronic Journal Scientific of Environmental Health And Disease*, 2(2). <https://doi.org/10.22437/esehad.v2i2.16919>
- Maulida, N., & Atzmardina, Z. (2022). Faktor-faktor

- yang berhubungan dengan kejadian diare pada balita. *Prepotif. Jurnal Kesehatan Masyarakat*, 6(3), 2280–2286. <https://doi.org/10.31004/prepotif.v6i3.6479>
- Maulida, Y., Yanti, R., Aprianti, A., & Fathurrahman, F. (2022). Hubungan Pendapatan Keluarga, Pola Asuh, Riwayat Penyakit Infeksi dan Status Imunisasi Dasar dengan Kejadian Wasting pada Balita. *Jurnal Riset Pangan Dan Gizi*, 4(1). <https://doi.org/10.31964/jr-panzi.v4i1.145>
- Nurul Awalia, Muhammad Khidri Alwi, Ayu Puspitasari, Sitti Patimah, & Rezky Aulia Yusuf. (2023). Faktor-Faktor Yang Berhubungan Dengan Kejadian Diare Pada Anak Usia 1-4 Tahun Di Puskesmas Antang Kota Makassar. *Window of Public Health Journal*, 4(2). <https://doi.org/10.33096/woph.v4i2.719>
- Oktariana, M., Hariyanti, R., Riya, R., & Sulastri, S. (2023). Hubungan Status Gizi dan Status Imunisasi dengan Kejadian Diare pada Balita di Puskesmas Putri Ayu Kota Jambi. *Jurnal Ilmiah Ners Indonesia*, 4(2). <https://doi.org/10.22437/jini.v4i2.27518>
- Oktavianisya, N., Yasin, Z., & Alifitah, S. (2023). Kejadian Diare pada Balita dan Faktor Risikonya. *Jurnal Ilmiah STIKES Yarsi Mataram*, 13(2), 66–75. <https://doi.org/10.57267/jisym.v13i2.264>
- Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., ... & Moher, D. (2021). *The PRISMA 2020 statement: an updated guideline for reporting systematic reviews*. *BMJ*, 372, n71. <https://doi.org/10.1136/bmj.n71>
- Perwitasari, Y. A., Ningrum, A. G., Puspitasari, D., & Fatmaningrum, W. (2024). Analisis Faktor Resiko Diare pada Balita di Wilayah Kerja Puskesmas Gading Kota Surabaya. *Indonesian Journal on Medical Science*, 11(2). <https://doi.org/10.70050/ijms.v11i2.479>
- Pietrzak, B., Tomela, K., Olejnik-Schmidt, A., Mackiewicz, A., & Schmidt, M. (2020). Secretory iga in intestinal mucosal secretions as an adaptive barrier against microbial cells. In *International Journal of Molecular Sciences* (Vol. 21, Issue 23). <https://doi.org/10.3390/ijms21239254>
- Rahmat, D., Firmansyah, A., Timan, I. S., Bardosono, S., Prihartono, J., & Gayatri, P. (2023). Risk factors of prolonged diarrhea in children under 2 years old. *Clinical and Experimental Pediatrics*, 66(12). <https://doi.org/10.3345/cep.2023.00668>
- Rini, L. (2021). Hubungan Status Imunisasi Campak dengan Kejadian Penyakit Diare (Campak, ISPA Dan Diare) dan Status Gizi Anak Usia 1-4 Tahun di Desa Karang Duren Kecamatan Tenggaran Kabupaten Semarang Lestiyu. *Journal of the American Chemical Society*, 123(10).
- Sidabutar, S. (2020). Buku Ajar Epidemiologi. In Handoyo (Ed.), *Forum Ilmiah Kesehatan (FORIKES)*. Forum Ilmiah Kesehatan (FORIKES).
- Simon, A. K., Hollander, G. A., & McMichael, A. (2015). Evolution of the immune system in humans from infancy to old age. In *Proceedings of the Royal Society B: Biological Sciences* (Vol. 282, Issue 1821). <https://doi.org/10.1098/rspb.2014.3085>
- Sitopu, S. D., Manalu, I., & Afriani, I. (2021). Relationship of Parenting Patterns With Diarrhea in Children in The Hospital Of Stella Maris Medan's Mother And Child Hospital. *Jurnal Darma Agung Husada*, 8(April). <http://dx.doi.org/10.46930/darmaagunghusada.v11i2.4833>
- Syadat, M., Gobel, A., & Ikhtiar, M. (2022). Determinan Kejadian Diare berdasarkan Segitiga Epidemiologi Di Wilayah Kerja Puskesmas Antang Kota Makassar. *Journal of Muslim Community Health*, 3(2). <https://doi.org/10.33096/jmch.v3i2.1538>
- Tiasafitir, Y., Sholih, M. G., & Sulfiani, L. (2022). Hubungan Status Gizi Dengan Kejadian Diare Pada Balita Usia 24-59 Bulan. *Jurnal Ilmiah Wahana Pendidikan*, 8(18), 407–419. <https://doi.org/10.5281/zenodo.7135902>
- Triandini, E., Jayanatha, S., Indrawan, A., Putra, G. W., & Iswara, B. (2019). Metode Systematic Literature Review untuk Identifikasi Platform dan Metode Pengembangan Sistem Informasi di Indonesia. *Indonesian Journal of Information Systems*, 1(2), 63–77. <https://doi.org/https://doi.org/10.24002/ijis.v1i2.1916>
- Troeger, C., Khalil, I. A., Rao, P. C., Cao, S., Blacker, B. F., Ahmed, T., Armah, G., Bines, J. E., Brewer, T. G., Colombara, D. V., Kang, G., Kirkpatrick, B. D., Kirkwood, C. D., Mwenda, J. M., Parashar, U. D., Jr, W. A. P., Riddle, M. S., Steele, A. D., Thompson, R. L., ... Jr, R. C. R. (2018). Rotavirus Vaccination and the Global Burden of Rotavirus Diarrhea Among Children Younger Than 5 Years. *JAMA Pediatr*, 172(10), 958–965. <https://doi.org/https://doi.org/10.1001/jamapediatrics.2018.1960>
- Ugboko, H. U., Nwinyi, O. C., Oranusi, S. U., & Oyewale, J. O. (2020). Childhood diarrhoeal diseases in developing countries. In *Heliyon* (Vol. 6, Issue 4). <https://doi.org/10.1016/j.heliyon.2020.e03690>
- WHO. (2024). *Diarrhoeal disease*. World Health Organization.
- Widiantari, N. M., Cempaka, P. M. V. P., Nesa, N. N. M., Karyana, I. P. G., & Wati, K. D. K. (2022). Hubungan Vaksinasi Rotavirus

- dengan Kejadian Diare pada Anak Usia 6-24 Bulan di Kota Denpasar. *E-Jurnal Medika Udayana*, 11(2).
<https://doi.org/10.24843/mu.2022.v11.i02.p18>
- Wulandari, F. (2024). Faktor-Faktor Yang Mempengaruhi Kejadian Diare Pada Balita di Puskesmas Jati Bening Bekasi Tahun 2023. *Jurnal Bidang Ilmu Kesehatan*, 14(4).
<https://doi.org/10.52643/jbik.v14i4.4014>
- Zheng, Y., Correa-Silva, S., Palmeira, P., & Carneiro-Sampaio, M. (2022). Maternal vaccination as an additional approach to improve the protection of the nursling: Anti-infective properties of breast milk. In *Clinics* (Vol. 77).
<https://doi.org/10.1016/j.clinsp.2022.100093>