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Research Article

Evaluation of the Rationality of the Use of Antibiotics in Paediatric Diarrheal Patients in Hospital Inpatient Facilities in the City of Bandung

Evaluasi Rasionalitas Penggunaan Antibiotik pada Pasien Diare Anak di Fasilitas Rawat Inap Rumah Sakit di Kota Bandung

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ABSTRACT

Diarrhoea in children is often associated with irrational antibiotic use, even though the cause is not bacterial infection. Excessive antibiotic use can increase antibiotic resistance, a significant problem in healthcare. This study aimed to evaluate the rationality of antibiotic use in paediatric inpatients with diarrhoea at a single hospital in Bandung, including demographic characteristics, types of antibiotics used, and appropriate indication, drug selection, dosage, and administration intervals. This study was observational, using a non-experimental descriptive analysis design. Data collection was conducted retrospectively from January to December 2024. Out of a total population of 229 patient medical records, 54 patient medical records met the inclusion criteria and were used as the study sample. The rationality of drug use refers to the Indonesian Ministry of Health's guideline. The results showed that 55.6% of patients were male, with toddlers (46.2%) being the largest age group. Ceftriaxone was the most commonly prescribed antibiotic (24%). The rationality of antibiotic use was 100% for indications and drug selection, 94.4% for dosage, and 90.7% for the interval between doses. However, the identified discrepancies in dosage (5.6%) and administration intervals (9.3%) require immediate attention to minimize the risk of therapeutic failure and antibiotic resistance.

Keywords: Antibiotic Resistance, Antibiotic Use, Paediatric Diarrhoea, Paediatrics, Rational Treatment

ABSTRAK

Diare pada anak sering dikaitkan dengan penggunaan antibiotik yang tidak rasional, meskipun penyebabnya bukan infeksi bakteri. Penggunaan antibiotik yang berlebihan dapat meningkatkan resistensi antibiotik, yang merupakan masalah signifikan dalam perawatan kesehatan. Studi ini bertujuan untuk mengevaluasi rasionalitas penggunaan antibiotik pada pasien rawat inap anak dengan diare di satu rumah sakit di Bandung, termasuk karakteristik demografis, jenis antibiotik yang digunakan, dan ketepatan indikasi, pemilihan obat, dosis, dan interval pemberian. Studi ini bersifat observasional, menggunakan desain analisis deskriptif non-eksperimental. Pengumpulan data dilakukan secara retrospektif dari Januari hingga Desember 2024. Dari total populasi 229 rekam medis pasien, 54 rekam medis pasien memenuhi kriteria inklusi dan digunakan sebagai sampel penelitian. Rasionalitas dievaluasi berdasarkan Pedoman Penggunaan Antibiotik rumah sakit dan Pedoman Antimikroba 2024. Hasil menunjukkan bahwa 55,6% pasien adalah laki-laki, dengan balita (46,2%) sebagai kelompok usia terbesar. Ceftriaxone adalah antibiotik yang paling sering diresepkan (24%). Rasionalitas penggunaan antibiotik adalah 100% untuk indikasi dan pemilihan obat, 94,4% untuk dosis, dan 90,7% untuk interval antar dosis. Namun, pemantauan yang lebih ketat terhadap dosis antibiotik dan interval antar dosis diperlukan untuk mengurangi risiko resistensi antibiotik di masa mendatang dan meningkatkan hasil pengobatan. Edukasi tentang penggunaan antibiotik yang rasional sangat penting bagi tenaga medis dan orang tua.

Kata Kunci: Diare Anak, Pediatrik, Penggunaan Antibiotik, Rasionalitas Pengobatan, Resistensi Antibiotik

I. INTRODUCTION

Children are one of the groups most vulnerable to various health problems in society, especially those related to infectious diseases. Children's lives are greatly influenced by their high dependence on their parents, so the health problems they face often have a significant impact on their development. One of the diseases commonly affecting children is diarrhoea, which is an important health problem in many developing countries, including Indonesia (Sasarari et al., 2023). Diarrhoea is defined as an increase in the frequency of bowel movements to more than three times in 24 hours with stool consistency that is more liquid or softer than usual (Juffrie, 2010). Click or tap here to enter text.In children, diarrhoea can occur when stool volume exceeds 10 ml/kg/day. The leading cause of diarrhoea is infection, which various microorganisms, including viruses, bacteria, and parasites can cause. In addition, environmental, socio-economic, and dietary factors also play a role in increasing the incidence of diarrhoea in the community (Anggraini & Kumala, 2022).

Data from the WHO (2024) shows that diarrhoea accounts for 23% of global under-five deaths, with approximately 1.17 million deaths in 2021 (World Health Organization, 2024). Diarrhoea is one of

the leading causes of morbidity and mortality among children in Indonesia, particularly in West Java Province. Poor sanitation, lack of access to clean water, and low public awareness of healthy living practices exacerbate this situation (Syahputra & Hastono, 2025). The prevalence of diarrhoea in children under five years of age reaches 12.8%, with the city of Bandung recording a prevalence of 10.48% (Riskesdas 2018, 2019). The management of diarrhoea in children generally involves three main elements, namely dehydration therapy, zinc supplementation, and continued feeding. Antibiotics are only given if a bacterial infection causes diarrhoea. However, antibiotics are often used for diarrhoea that is not caused by bacterial infections, which can lead to antibiotic resistance and increase unnecessary treatment costs (Novita et al., 2023).

The importance of evaluating the rationality of antibiotic use in childhood diarrhoea is highly relevant, as inappropriate antibiotic use can increase the risk of resistance and add to treatment costs. According to a study by Trisnowati (2017), 93.02% of paediatric patients with acute diarrhoea received antibiotics, even though most cases of diarrhoea in children are caused by viral infections, which do not require antibiotics (Trisnowati, 2017). Therefore, this study aimed to evaluate the rationality of antibiotic use in pediatric patients with diarrhea in the inpatient ward of a hospital in Bandung. Evaluating the rational use of antibiotics requires a standardized approach. In Indonesia, this is typically assessed using parameters defined by the Ministry of Health, which include appropriate indication, appropriate drug selection, appropriate dosage, and appropriate administration intervals. Investigating these parameters, particularly the precision of dosage and intervals, is crucial because pediatric patients are highly sensitive to pharmacokinetic variations; incorrect dosing or irregular intervals can easily lead to sub-therapeutic failure or increased toxicity (Indonesian Ministry of Health, 2011). The hospital was selected because it serves as a primary referral center with a significant rate of pediatric diarrhea cases in the region. This study focused on patient characteristics, the types of antibiotics used, and adherence to applicable guidelines. The antibiotic use guidelines of Dr. Hasan Sadikin General Hospital and the 2024 antimicrobial guidelines were used as benchmarks for rationality.

II.METHOD

This study was observational, using a non-experimental descriptive analysis design. Data collection was conducted retrospectively from January to December

2024. Out of a total population of 229 patient medical records, 54 patient medical records met the inclusion criteria and were used as the study sample. Rationality was evaluated based on the hospital's Antibiotic Use Guidelines and the 2024 Antimicrobial Guidelines.

The inclusion criteria included medical records of patients diagnosed with diarrhoea (ICD-10 code A09 : Acute gastroenteritis) between January and December 2024, inpatients and patients aged 0-18 years. Exclusion criteria included 157 patients who did not receive antibiotic therapy, 0 patient who had transferred to another treatment facility, and 18 patients has passed away (Figure 1).

The sampling method used in this study was *total sampling*. *Total sampling* is a sampling method in which the entire population that meets the inclusion criteria is selected for the sample. Ethical approval for this study was obtained from the Research Ethics Committee of Dr. Hasan Sadikin General Hospital, Bandung, with the number: DP. 04.03 / D.XIV.6.5 / 203 / 2025. The data analysed included gender, age, length of treatment, type of antibiotic, accuracy of indication, choice of drug, dosage, and interval between antibiotic administrations.

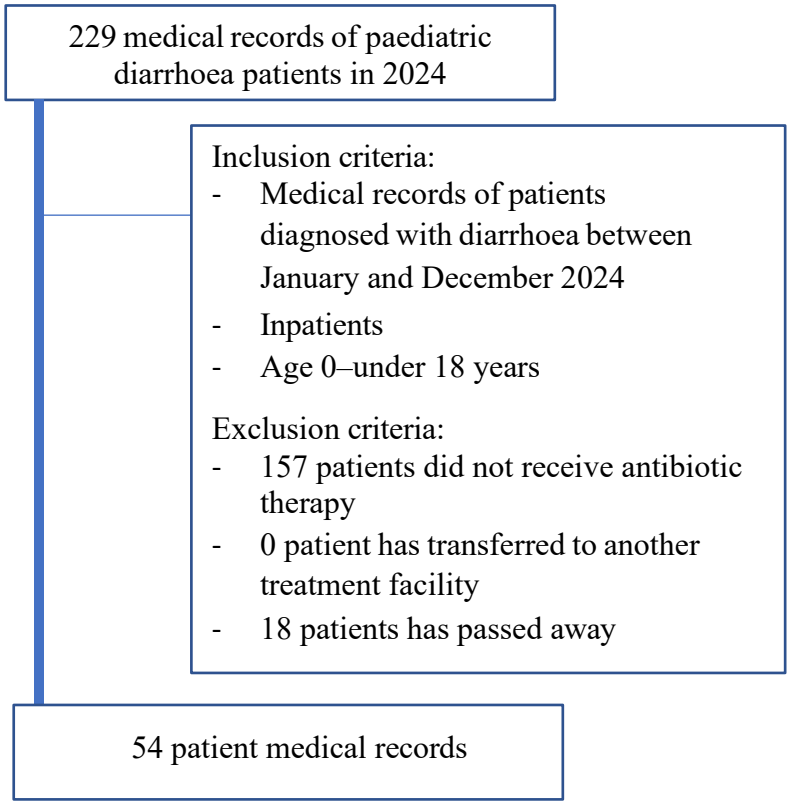

Figure 1. Flowchart of the fulfilment of inclusion criteria for patient medical records used in the study

The rationality of drug use refers to the Indonesian Ministry of Health's guideline. The assessment instrument focused on four parameters: appropriate indication (Antidiarrheal drugs is administered to patients diagnosed with Acute Gastroenteritis / ICD-10 A09 according to the hospital's Antibiotic Use Guidelines), appropriate drug selection (The types and combinations of anti-Diarrheal drugs administered are in accordance with the hospital's Antibiotic Use Guidelines), appropriate dosage (The dosage of anti-Diarheal drugs administered are in accordance with the 2024 Antimicrobial Guidelines), and appropriate administration interval (The administration dosage of anti-Diarheal drugs administered are in accordance with the 2024 Antimicrobial Guidelines) (Indonesian Ministry of Health, 2011).

III. RESULTS AND DISCUSSION

A. Rationality of Antibiotic Use

The evaluation of antibiotic use rationality showed positive results. 100% of antibiotic indications were in accordance with the guidelines, 100% of drug selection was appropriate, 96% of doses administered were relevant, and 90.7% of antibiotic administration intervals were appropriate. However, there were slight discrepancies in the dosage of ceftriaxone and cotrimoxazole, as well as in the antibiotic administration intervals for some patients.

B. Patient Characteristics

During the period January–December 2024, 229 paediatric patients were diagnosed with diarrhoea. A total of 54 medical records met the inclusion criteria for research subjects, while 175 medical records met the exclusion criteria (Figure 1). Table I shows the characteristics of paediatric patients by gender, indicating that those admitted to hospitals in Bandung from January to December 2024 were predominantly male (55.6%), while female patients accounted for 44.4%. A similar study conducted at a hospital in Bukit Tinggi also showed the same results: male paediatric diarrhoea patients (60.44%) had a higher proportion than female paediatric patients (39.56%) (Armal et al., 2022). Similar results were also obtained from the Aura Syifa Hospital in Kediri Regency in 2021, which showed that male paediatric diarrhoea patients (66%) had a higher percentage than female paediatric diarrhoea patients (34%)(Lailiyah, 2023).

Several studies indicate that boys tend to be more physically active than girls, which can affect their physical condition and immune system (Wrona et al., 2024). This high level of physical activity can cause fatigue and reduced endurance, increasing susceptibility to infectious

diseases, including diarrhoea (Baker et al., 2016) Although there is evidence that gender can affect children's health, it is essential to consider contemporary factors such as sanitation and behavioural patterns. Awareness and implementation of effective health interventions can improve children's health, especially among boys who may be more susceptible to infectious diseases (Baker et al., 2016).

Table I. Patients characteristics

Characteristics	n = 54	
	Number	%
Gender		
Male	30	55.6
Female	24	44.4
Age		
0-28 Days (Neonatal)	0	0
0-Before 1 Years (Infant)	11	20.4
1-Before 5 Years (Toddler)	25	46.2
5-6 Years (Pre-school)	4	7.4
7-Before 18 Years (School Age)	14	26.0
Length of Treatment (Days)		
1-7	21	38.9
8-14	28	51.9
15-21	4	7.4
>21	1	1.8
Diagnosis		
Diarrhoea (ICD-10 code A09 : Acute Gastroenteritis)	54	100

Research conducted at a hospital in Bandung shows that most cases of diarrhoea occur in the 1-5 age group (toddlers), accounting for 46.2%. These results are consistent with a 2019 study by Karya Bakri Ujung Bandar Rantauprapat General Hospital, which found that the highest number of paediatric diarrhoea patients were in the toddler age group, at 54.7% (Gultom & Khairani, 2021). This comparison is highly relevant because both studies share identical clinical settings and methodologies; both evaluated paediatric diarrhoea cases specifically within the inpatient wards of General Hospitals, utilizing a retrospective descriptive design based on medical records. This methodological similarity strengthens the observation of a consistent national trend regarding toddler vulnerability to diarrhoea. This finding aligns with various previous studies and prevalence surveys, which generally state Diarrhoea more frequently affects toddlers. In children under 2 years of age, the production of several digestive enzymes, such as pancreatic lipase, is not yet fully developed. Children's weaker immune defence mechanisms or imperfect immunity compared to adults also make them, especially those under 5 years of age, susceptible to Rotavirus, the leading cause of acute diarrhoea worldwide(Novita et al., 2023). Diarrhoea itself contributes to 23%

of under-five deaths and is responsible for approximately 1.17 million under-five deaths worldwide in 2021 (World Health Organization, 2024).

The leading cause of diarrhoea in toddlers is malnutrition. Every year, there are 1.7 billion cases of diarrhoea in children. Children who are malnourished or have compromised immune systems experience life-threatening diarrhoea. In the past, most people experienced severe dehydration that could cause diarrhoea, but now another cause of diarrhoea is septic bacterial infection, which causes diarrhoea-related deaths. Diarrhoea is a symptom of intestinal tract infection, which various bacterial, viral, and parasitic infections can cause. Infections spread through contaminated food and drinks or from person to person due to poor sanitation (Iryanto et al., 2021).

Table I shows that the length of treatment for diarrhoea patients was 8-14 days, with the highest percentage at 51.9%. The length of stay of 1 to 7 days was 38.9%, 15 to 21 days was 7.4%, and > 21 days was 1.8%. From these results, it can be seen that acute diarrhoea generally lasts less than 14 days, this can occur because most children with acute diarrhoea can usually recover within a few days when properly treated (Anggastya et al., 2019).The results of this study differ from those of a 2021 study at Aura Syifa Hospital in Kediri Regency, which found that a hospitalisation length of 2-3 days accounted for the largest percentage (48%) (Lailiyah, 2023). The results of this study also differ from those of a 2022 survey at Soedirman General Hospital, which found that the most common duration of treatment for acute diarrhoea in paediatric patients receiving antibiotics was 4 to 5 days (58.57%) (Ainni et al., 2024).

Several factors influence the relationship between antibiotic use and treatment duration, including the severity and type of bacteria causing the infection (Yuniati et al., 2016). This is because if the antibiotic treatment is too short, it may lead to the recurrence of previously subsided clinical symptoms and even cause antibiotic resistance in patients, thereby slowing the healing process (Landwehr et al., 2019).

C. Antibiotic Use

Based on the types of antibiotics used for paediatric diarrhoea patients in the inpatient ward of a hospital in Bandung, as shown in Table II, the most commonly used single antibiotic was third-generation cephalosporin, specifically ceftriaxone monotherapy, with 15 prescriptions (27.8%). This study is similar to a survey of paediatric inpatients at a hospital in Bukittinggi, which found that the most commonly used antibiotic class was third-

generation cephalosporins, with Ceftriaxone as the most frequently prescribed antibiotic at 37.27%. This antibiotic is safe for use in treating infectious diseases in children. In addition, cephalosporins are a class of antibiotics intended for empirical therapy (therapy for diseases whose cause is unknown, without laboratory confirmation, and generally given at the start of treatment) (Rachmawati et al., 2020). However, this practice may inadvertently contribute to the spread of antibiotic resistance. The next most commonly used single drug is Ampicillin (11.1%). Ampicillin is a broad-spectrum beta-lactam antibiotic that is effective against Gram-positive and Gram-negative bacteria, interfering with bacterial cell wall synthesis (Sukawaty et al., 2017).

Combination antibiotics, such as Ampicillin and Gentamicin, are also used in some patients at a rate of 16.7%. The use of this combination must be evaluated based on the bacterial sensitivity profile, as resistance of specific strains to Ampicillin may necessitate therapy modification (Readman et al., 2023). However, in most cases, especially in hospital settings, the combination of Ampicillin and Gentamicin remains the standard of care for serious infections, as recommended by the WHO (Garrido et al., 2021). This demonstrates that a planned, evidence-based antibiotic policy is essential to achieving optimal clinical outcomes.

Table II. Antibiotic Use Patterns

Antibiotic classes	Antibiotic types	n = 54	
		Σ	%
Single			
Cephalosporin	Ceftriaxone	15	27.8
Penicillin	Ampicillin	6	11.1
Cephalosporin	Ceftazidime	3	5.6
Nitroimidazole	Metronidazole	3	5.6
Penicillin	Amoxicillin	2	3.7
Sulphonamide	Cotrimoxazole	2	3.7
Cephalosporin	Cefotaxime	1	1.9
Fluoroquinolone	Ciprofloxacin	1	1.9
Combination			
Penicillin + Aminoglycoside	Ampicillin + Gentamicin	9	16.7
Cephalosporin + Nitroimidazole	Ceftriaxone + Metronidazole	7	13.0
Aminoglycoside + Cephalosporin	Gentamicin + Cefotaxime	2	3.7
Cephalosporin + Aminoglycoside	Ceftriaxone + Gentamicin	1	1.9
Cephalosporin + Aminoglycoside	Ceftazidime + Gentamicin	1	1.9
Cephalosporin + Glycopeptide	Cefotaxime + Vancomycin	1	1.9

D. Evaluation of the Rational Use of Antibiotics

Antibiotic use was conducted on 54 medical records of paediatric diarrhoea patients in the inpatient ward of a hospital in Bandung during the period January–December 2024. The evaluation of rationality included several criteria, namely appropriate indication, appropriate drug selection, appropriate dosage, and appropriate administration intervals (Nurul Islamiyah et al., 2021).

Table III. Rationality of Antibiotics Use in Patients with Paediatric Diarrhoea

Criteria Reviewed	Rationality of Antibiotics Use	
	n	**%**
Appropriate Indication	54	100
Appropriate Drug Selection	54	100
Appropriate Dosage	51	94.4
Appropriate Dosage Intervals	49	90.7

Antibiotic administration is the primary treatment for infectious diseases. If antibiotics are not used according to the correct indications and rules of use, the dosage is incorrect, the method of use is faulty, or they are used for less Time. If the prescribed duration is exceeded, bacteria can become resistant. Antibiotic administration, especially in children and infants, must consider potential side effects on developing body systems and organs. To date, the principles of drug use in children in daily practice are primarily based on adult treatment principles (Nofiyani, 2020).

E. Appropriate Indication

Alignment between the administration of medication and the doctor's diagnosis. The choice of drugs refers to the diagnosis. If the diagnosis is incorrect, the medication used will not have the desired effect. Research shows that the accuracy of indications for treating diarrhoea in children at hospitals in Bandung is 100%, consistent with the literature in Table 3. All 54 patients (100%) were diagnosed with Acute Gastroenteritis, classified under ICD-10 code A09. The analysis evaluated appropriateness by cross referencing patients' primary diagnoses and documented clinical symptoms against established hospital guidelines. A 100% appropriateness rate for indication was achieved because all 54 sampled medical records explicitly noted clinical signs indicative of a bacterial infection such as bloody or mucoid stools (dysentery), persistent high fever, or severe colitis. Under both the hospital's Antibiotic Use Guidelines and the 2024 Antimicrobial Guidelines, these specific symptoms in acute gastroenteritis cases strongly justify the initiation of empirical antibiotic therapy. It is important to note that this high conformity rate is based entirely on adherence to empirical treatment

guidelines, not on microbiological culture confirmation. Gastroenteritis is an inflammation of the stomach and intestines that causes diarrhoea, without a known infectious cause. Acute gastroenteritis in children is defined as a disease that initially presents with diarrhoea, with or without abdominal pain, fever, nausea, or vomiting (Armal et al., 2022).

Antibiotic use in the diagnosis of ICD-10 code A09 (Acute Gastroenteritis) often involves cephalosporins. This is related to the function of cephalosporins (broad spectrum), which can fight gram-positive and gram-negative bacteria, as well as anaerobic bacteria. The purpose of using antibiotics is to prevent or treat bacterial infections that cause various disorders. The Antibiotics Use Guidelines (PPAB) of Dr. Hasan Sadikin General Hospital in Bandung state that the antibiotics Ciprofloxacin, Co-trimoxazole, and Metronidazole are indicated for patients with diarrhoea (Committee of PPRA RSUP Dr. Hasan Sadikin Bandung, 2023). The 2024 Antimicrobial Guidelines state that children with colitis symptoms who are awaiting culture results may use the antibiotic Ceftriaxone. Inappropriate antibiotic administration, such as the use of antibiotics with unclear indications, can increase the risk of antibiotic resistance (2024)(Children's Hospital Department of Pediatric Infecious Diseasess, 2024).

F. Appropriate Drug Selection

Appropriate drug selection means that the antibiotics chosen align with the Antibiotic Use Guidelines (PPAB) of Dr. Hasan Sadikin General Hospital, Bandung, and the 2024 Antimicrobial Guidelines. The study results showed 100% accuracy in drug selection among 54 patients (see Table III). The decision to classify these administered antibiotics as appropriate was based strictly on their conformity with the hospital's Antibiotic Use Guidelines and the 2024 Antimicrobial Guidelines. Under these guidelines, these specific medicines particularly third generation cephalosporins (e.g., Ceftriaxone) and the Ampicillin-Gentamicin combination are the recommended first line empirical therapies for paediatric acute gastroenteritis with suspected bacterial etiology, especially while awaiting microbiological culture results (Children's Hospital Department of Pediatric Infecious Diseasess, 2024; Committee of PPRA RSUP Dr. Hasan Sadikin Bandung, 2023). This study identified 10 antibiotic classes, including cephalosporins, penicillins, fluoroquinolones, nitroimidazoles, sulphonamides, and aminoglycosides. The most commonly administered antibiotics were third-generation cephalosporins, namely ceftriaxone, with a total percentage of 27.8%, and a combination of ampicillin and gentamicin, with a total rate of 16.7%.

To explicitly link these prescribing patterns with the hospital and national guidelines, Ceftriaxone (a third generation cephalosporin) is explicitly recommended by the 2024 Antimicrobial Guidelines as the primary empirical therapy for paediatric patients presenting with severe colitis or dysentery symptoms while awaiting stool culture results. Its broad-spectrum activity effectively targets common Gram-negative enteric pathogens. Meanwhile, the combination of Ampicillin (a broad-spectrum penicillin) and Gentamicin (an aminoglycoside) is recommended by the hospital's guidelines for cases requiring a synergistic approach. This combination is commonly utilized to treat moderate to severe presumed bacterial infections, providing comprehensive coverage against both Gram-positive and Gram-negative organisms before specific pathogen identification (Children's Hospital Department of Pediatric Infecious Diseasess, 2024; PPRA RSUP Dr. Hasan Sadikin Bandung, 2023).

This study is similar to a survey of paediatric inpatients at a hospital in Bukittinggi, which found that the most commonly used class of antibiotics was third-generation cephalosporins, with ceftriaxone IV being the most widely prescribed antibiotic (36.61%) (Armal et al., 2022). Another study conducted at Dr. Soebandi General Hospital in Jember found the most commonly prescribed antibiotic class was cephalosporins (46.23%) (Rachmawati et al., 2020). Ceftriaxone antibiotics are most widely used because they are active against Gram-negative bacteria, which are the most common pathogens causing acute infectious diarrhoea, namely Vibrio cholerae and Shigella dysenteriae. Vibrio cholerae is the most common bacterium causing diarrhoea, leading to white, watery faeces that can quickly lead to dehydration. Meanwhile, Shigella dysenteriae is a bacterium that causes dysentery or diarrhoea accompanied by blood (Novita et al., 2023). However, improper use of ceftriaxone can cause side effects and antibiotic resistance (Herman et al., 2024).

Antimicrobial combinations are used in severe infections where the causative bacteria are not clearly known. In this case, the administration of antimicrobial combinations aims to achieve the broadest possible spectrum of antimicrobial activity. Additionally, antimicrobial combinations are also used to achieve synergistic effects and to inhibit the development of resistance to the antimicrobial drugs used (Amin, 2015).

G. Appropriate Dosage

The correct dosage is the appropriateness of the antibiotic dosage within the therapeutic dosage range,

reviewed from the daily dosage based on the patient's specific condition. Research results from a hospital in Bandung show that 94.4% of antibiotic use is at the correct dosage according to the literature (see Table III). To illustrate the analysis plan, the dosage appropriateness was evaluated by calculating the exact dose administered against the patient's body weight and the recommended therapeutic range. For example, based on the Antimicrobial Guidelines 2024 used in this hospital, the standard prescribed dosage for the most commonly used antibiotic, intravenous Ceftriaxone, is 50 – 75 mg/kg/day (max. 2 g/day). The patient's actual administered dose was then cross-checked to ensure it fell strictly within this specific range (Children's Hospital Department of Pediatric Infecious Diseasess, 2024). Overdosing occurred in ceftriaxone antibiotics, which amounted to 1 prescription, and two prescriptions in cotrimoxazole antibiotics. Potential contributing factors to these dosing discrepancies may include inaccurate or outdated body weight documentation in the medical records, prescribing habits that default to standard doses, or limited dose adjustment based on patient-specific characteristics. Underdosing or a too-small dose cannot guarantee the desired therapeutic effect of an antibiotic, so the infecting bacteria will not die. Meanwhile, a dose that is too large can increase the risk of side effects.

The pattern of antibiotic use in paediatric patients with acute diarrhoea was in accordance with the antibiotic dose based on body weight and frequency of administration (Novita et al., 2023). Accurate dosing will determine the success of the therapy. Giving doses that exceed the recommended dose risks causing toxicity or undesirable effects. Giving doses that are too small will result in the drug not reaching therapeutic levels in the blood, thus rendering the therapy suboptimal (Islamiyah et al., 2021).

H. Appropriate Dosage Intervals

Table III shows the results of a study at a hospital in Bandung City, indicating that 90,7% of antibiotic administration for diarrhoea was at the correct interval according to the literature. Similarly, the administration intervals were evaluated by comparing the medical administration charts against the guideline's mandate for each specific drug's pharmacokinetics. As a clinical example from the study, Ceftriaxone was required to be administered every 12 to 24 hours, whereas Ampicillin required a more frequent interval of every 6 hours to maintain effective therapeutic levels (Children's Hospital Department of Pediatric Infecious Diseasess, 2024). In

comparison, 9,3% did not meet the correct administration interval. Incorrect administration of antibiotics can allow microorganisms to regenerate and become stronger, leading to antibiotic resistance and reduced antibiotic activity in the body. Furthermore, inappropriate dosing intervals may stem from varying shift schedules among nursing staff, delays in medication administration, or a lack of strict monitoring of the prescribed schedule in relation to the drug's half-life. The results of this study indicate that most antibiotic use in paediatric diarrhoea patients in hospitals in Bandung is in accordance with existing guidelines. However, inconsistencies in dosage and administration intervals indicate potential for improvement in antibiotic use.

Irrational antibiotic use practices can accelerate the development of antibiotic resistance, which will increase the burden on healthcare in the future. The negative impacts of irrational drug use are diverse and vary depending on the type of irrationality. These negative impacts may be experienced only by patients as side effects and high costs, or by the broader population through treatment and service quality (Islamiyah et al., 2021).

Revisiting the primary objective of this study to evaluate the rationality of antibiotic use across four key parameters the findings reveal a strong foundation in clinical decision-making regarding indications and empirical drug selection. This high level of conformity (100%) indicates that prescribers are well aligned with the hospital's current empirical guidelines for initiating therapy, which is a positive indicator of rational antibiotic use. However, the study also highlights critical areas for improvement in daily clinical practice, specifically concerning dosage accuracy (94.4%) and administration intervals (90.7%). To further enhance rational antibiotic use, clinical practices must address these specific gaps. Implementing strict protocols for re-evaluating patient body weight prior to prescription, alongside improving coordination among nursing shifts for timely administration, are practical steps necessary to minimize dosing errors, ensure optimal therapeutic outcomes, and mitigate the risk of resistance.

The limitations of this study are that it was conducted in a single hospital in Bandung, which may limit the generalisability of these findings to the national level. Secondly, this study relies heavily on existing guidelines and literature, which may not fully reflect more flexible or dynamic clinical practices. To build upon these findings and address these limitations, future research should focus on prospective study designs that include microbiological culture confirmation to

validate the clinical efficacy of current empirical therapies. Additionally, evaluating the impact of targeted interventions such as automated prescribing alerts or intensive educational programs on improving antibiotic dosing accuracy and adherence to administration intervals would provide valuable insights into optimizing clinical practice.

IV.CONCLUSION

This study shows that the use of antibiotics in paediatric patients with diarrhoea largely complies with guidelines on indications and drug selection. However, the identified discrepancies in dosage (5.6%) and administration intervals (9.3%) require immediate attention to minimize the risk of therapeutic failure and antibiotic resistance. Practical implications for clinical practice include implementing a mandatory double check system for patient body weight before prescribing and integrating an automated alert system within the hospital's electronic prescribing system to notify clinicians of incorrect intervals. Future research should prioritize prospective studies that incorporate microbiological culture confirmation to assess the clinical outcomes of empirical therapy, and evaluate the effectiveness of targeted educational interventions on prescribing habits.

CONFLICT OF INTEREST

The authors declare that there are no conflicts of interest related to this research. All findings and conclusions presented in this article are the result of objective evaluation and are not influenced by personal, financial, or external affiliations.

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