

Two Decades Survey of Antibiotics Prescription and Usage in Community

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Abstract

Introduction: Irrational antibiotic use in pediatric populations remains a significant challenge in Indonesia, contributing to antibiotic resistance. Despite interventions and public awareness campaigns, inappropriate antibiotic prescribing and self-medication persist among patients, healthcare providers, and pharmacies. This study aims to identify trends, challenges, and potential solutions for promoting rational antibiotic use in Indonesia.

Methods: A retrospective review was conducted on 11 unpublished survey studies by YOP related to antibiotic use in pediatric populations and healthcare practices in Indonesia from 2004 to 2023. Data sources included prescription surveys (2004-2012), community perception surveys (2014-2023), and healthcare provider assessments (2010-2013). Prescription patterns, antibiotic perceptions, and dispensing practices were analyzed.

Results: The public surveys over two decades show a decline in the behavior of buying antibiotics without a prescription (from 91% to 23%), while the prescribing of antibiotics for colds and coughs remains high and unchanged (around 68-79%). Pharmacy assessments found that 85% of pharmacies dispensed antibiotics without a prescription and 43% advised antibiotics for URTI.

Conclusion: Misconceptions about antibiotics, lack of stringent regulations on antibiotic sales, and continued overprescription by healthcare providers are the key factors of irrational antibiotic usage in pediatric population in Indonesia.

Keywords: Antibiotics, Pediatrics, Perception, Prescription, Self-Medication

Survei Dua Dekade tentang Resep dan Penggunaan Antibiotik di Masyarakat

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Abstrak

Pendahuluan: Penggunaan antibiotik yang tidak rasional pada populasi anak-anak tetap menjadi tantangan signifikan di Indonesia, yang berkontribusi terhadap resistensi antibiotik. Meskipun telah dilakukan intervensi dan kampanye kesadaran publik, persepsian antibiotik yang tidak tepat dan pengobatan sendiri masih terjadi di kalangan pasien, penyedia layanan kesehatan, dan apotek. Studi ini bertujuan untuk mengidentifikasi tren, tantangan, dan solusi potensial untuk mempromosikan penggunaan antibiotik yang rasional di Indonesia.

Metode: Tinjauan retrospektif dilakukan pada 11 survei yang belum dipublikasikan oleh YOP terkait penggunaan antibiotik pada populasi anak-anak dan praktik perawatan kesehatan di Indonesia dari tahun 2004 hingga 2023. Sumber data meliputi survei resep (2004-2012), survei persepsi masyarakat (2014-2023), dan penilaian penyedia layanan kesehatan (2010-2013). Analisa dilakukan dengan melihat pola persepsian, persepsi antibiotik, dan praktik pemberian obat.

Hasil: Survei publik selama dua dekade menunjukkan penurunan perilaku pembelian antibiotik tanpa resep (dari 91% menjadi 23%), sementara pemberian resep antibiotik untuk pilek dan batuk tetap tinggi dan tidak berubah (sekitar 68-79%). Penilaian terhadap apotek ditemukan bahwa 85% apotek menjual antibiotik tanpa resep dan 43% menyarankan antibiotik untuk infeksi saluran pernapasan atas (ISPA).

Kesimpulan: Kesalahpahaman tentang antibiotik, kurangnya regulasi yang ketat terhadap penjualan antibiotik, dan pemberian resep berlebihan yang terus berlanjut oleh penyedia layanan kesehatan merupakan faktor kunci penggunaan antibiotik yang tidak rasional pada populasi anak di Indonesia.

Kata kunci: Antibiotik, Pediatri, Persepsi, Resep, Pengobatan Mandiri

Introduction

Antimicrobial resistance (AMR) remains a growing global health threat, impacting particularly low- and middle-income countries.¹ It includes resistance against bacteria responsible for common childhood infections such as acute respiratory infections and diarrhea.² According to World Health Organization (WHO), an estimated death toll of 1.27 million attributed to AMR in 2019 worldwide.³ The major driver of AMR is the misuse and overuse of antibiotics, contributing to the emergence and development of drug-resistant pathogens.⁴

Antibiotic misuse has affected both

children and adults across all regions and income levels.³ The WHO estimates that more than 50% of medications are prescribed inappropriately, being unnecessary, ineffective, or unsafe, while essential drugs often remain under-prescribed.⁵ To address this issue, the WHO's 1985 declaration on the Rational Use of Drugs (RUD) during The Conference of Experts on the RUD in Nairobi emphasized that medications should be prescribed based on clinical needs, in appropriate doses, for the correct duration, and at the lowest cost to both patients and society.⁶ Despite this guidance, irrational prescribing practices persist, including excessive polypharmacy, inappropriate antibiotic use, reliance on injections when oral

medications would suffice, non-adherence to clinical guidelines, and improper self-medication.⁷

Indonesia is a lower-middle-income country in Southeast Asia that faces a growing challenge of antibiotic overuse.⁸ Antibiotics account for a significant portion of medication expenditures, particularly in treating upper respiratory tract infections (URTIs), which alone constitute 63% of total drug costs. The financial burden of medications for common childhood illnesses like diarrhea and URTIs is substantial, especially for children under five, where these treatments make up 68% of total healthcare expenses. However, antibiotic treatments may not be necessary in such cases. Lower socioeconomic status and education level are underlying causes of antibiotic overuse.⁹

Although research on antibiotic use exists, community-based studies focusing on children under five years of age in Indonesia remain limited.⁸ Previous investigations have documented antibiotic prescribing patterns in primary healthcare facilities and hospitals, while studies in Boyolali Regency, Central Java, and Bandung, West Java highlight the availability of over-the-counter antibiotics and the common practice of self-medication.¹⁰⁻¹² Despite the efforts of Indonesian Ministry of Health through strategic plans from 2015–2019, the country still lacks a national AMR surveillance system, creating critical gaps in data.¹³

For over two decades, the Concerned and Caring Parent Foundation- Orang tua Peduli (YOP) has been actively involved in research and advocacy related to the rational use of antibiotics in pediatric care.¹⁴ Through 11 survey studies (unpublished) involving both patients and healthcare providers (Table 1), YOP has gathered critical insights into prescribing patterns, antibiotic misuse, and public perceptions. The present research aims to consolidate these findings, provide valuable data for stakeholders, and guide future interventions to improve antibiotic stewardship in pediatric population in Indonesia.

Methods

Study Design

This study is a retrospective descriptive review of 11 unpublished survey and observational studies conducted between 2004 and 2023. The studies were carried out by the YOP to evaluate trends in antibiotic use, prescribing practices, dispensing behavior, and

public perceptions related to pediatric health in Indonesia.

Research Strategy

An internal audit was conducted to identify and review all relevant surveys and studies conducted by YOP over the past two decades. As part of this process, archived data, internal reports, and publications from YOP were searched, retrieved, and compiled by two researchers independently. Discrepancies were resolved through discussion. Afterwards, the methodology and target populations of each study were verified and data were compiled into a master dataset for synthesis. A formal database search was not conducted, as all the surveys included in this review were internal and unpublished.

Eligibility Criteria

For inclusion in this review, studies were required to meet several predefined criteria. Specifically, eligible studies must have been published between 2004 and 2023. Their focus needed to center either on antibiotic uses within pediatric populations or on public and community perceptions of antibiotics. Furthermore, only studies that employed recognized research methods, such as online or offline surveys, prescription audits, or simulated client techniques were considered, provided they collected data directly relevant to prescribing patterns, pharmacy practices, or public attitudes and knowledge regarding antibiotics. Conversely, studies were systematically excluded if they lacked primary data, represented duplicate reports, or featured incomplete or inaccessible documentation.

Participants

The study design, target population, and objectives varied across the 11 included surveys. In general, participants included were: a) parents or caregivers of children under five years for prescription and behavior-related surveys; b) Healthcare providers or pharmacists for surveys on prescribing or dispensing practices; c) University students and members of the public for perception, youth behavior and self-medication trends, and knowledge surveys; d) Participants who gave informed consent or responded voluntarily (online or offline); and e) Participants residing in Indonesia.

Data Collection

The data for this review were synthesized from various cross-sectional surveys and observational studies (Table 1), categorized into three distinct categories based on their design and focus. The first category comprised Prescription Surveys (2004-2012), which primarily aimed to evaluate antibiotics prescribing patterns for common pediatric illnesses, specifically cough and cold (without shortness of breath), watery diarrhoea (without blood) and fever. Data for these surveys were collected through an online parent forum, email responses, or direct submission of a physical prescription to YOP offices by parents following medical consultations. The second category, Healthcare Provider and Pharmacy Surveys (2010-2013), was specifically designed to examine prescribing practices through the innovative use of the simulated client method, where surveyors posed as parents of children under five seeking anti-

otics for cough and cold symptoms without a prescription. Finally, Community Perception Surveys (2014-2023) were conducted via both online platforms and offline events to comprehensively assess public knowledge, attitudes, and behaviors toward antibiotic use.

Data Analysis

The collected data were analyzed to assess trends in antibiotic prescriptions particularly for non-bacterial infections, to identify regional differences in prescribing practices, and perceptions and behavior of healthcare workers, parents and pharmacists towards antibiotic usage. Descriptive statistics were used to summarize the findings from the reviewed studies, including frequencies and percentages to illustrate antibiotic prescription rates, community perceptions, and pharmacy dispensing practices. No inferential statistics were applied due to the observational and descriptive nature of the datasets.

Table 1. List of Surveys Conducted Between 2004 to 2023

Title	Year	Method	Target Population	Sample Size	Key Outcomes
Prescribing Patterns for Pediatric Common Health Problems	2004	Descriptive, retrospective cross-sectional study. Data was collected from mailing list "sehat" (http://groups.yahoo.com/group/sehat). Online method.	Children under 5 with cough, diarrhea, and fever.	160 eligible emails analyzed.	61.46% senders were women aged 26–30 yrs; 83.7% worked in private sector. Majority had one child and the median age of child was 13 months. Antibiotic prescription: diarrhea (44–78%), ARI (60–79%), fever (86%).
Prescribing Patterns for Pediatric Common Health Problems	2006	Softcopies sent via email and hardcopies sent to YOP office.	Children under 5.	123 parents participated.	Antibiotic use: URTI (54.5%), fever (86.4%), diarrhea (74.1%). Common antibiotics: Cefixime for URTI (46%) and fever (52%), Cotrimoxazole for diarrhea (33%).
Irrational Prescribing for URTI in Children	2008–2009	Descriptive cross-sectional. Online data from sehat@yahoo.com .	Children under 5 with URTI (cough & cold <7 days) in Jakarta versus other cities	583 prescriptions	Jakarta vs other cities: Antibiotic use: cephalosporin-cefadroxil (67.3% vs. 78.4%), antihistamines (81.5% vs. 75.9%), steroids (58.3% vs. 56.9%), mucolytics (61.5% vs. 69.1%), bronchodilators (57.5% vs. 51.4%), decongestant (48.8% vs. 47.2%), antipyretic (40.7% vs. 40.5%), antitussive (21.6% vs. 27.4%), and anticonvulsant (24.2% vs. 12.2%). Avg. drugs/prescription: 5–6. Avg. cost: IDR 137,573 vs 112,512. Generic use: 28.3% vs 16.25%.
Antibiotic Prescription Among Healthcare Workers	2010	Self-administered questionnaires during seminar "Update on Pediatric Infection 2010" (offline).	Doctors	92	89.1% of doctors had ≤10 years of practice. 64.1% saw <100 patients/week. Pediatric cases: ≤25% (31.5%) to 75–100% (9.8%). Self-reporting antibiotic prescription in cases of lobar pneumonia (90.2%), prevention of secondary infection (83.7%), and cough (81.5%).

Table 1. List of Surveys Conducted Between 2004 to 2023

Title	Year	Method	Target Population	Sample Size	Key Outcomes
Outpatient Clinic Prescription Patterns	2012	Random survey in private outpatient clinics, Jakarta.	prescriptions analyzed.	204	59.8% of prescriptions included antibiotics for URTI (48%), fever (38%), and diarrhea (14%).
Survey on Antibiotic Purchase Without Prescription	2013	Cross-sectional. Simulated Client Method. 100 pharmacies randomly selected from Jakarta.	Pharmacists	100	Most pharmacies allowed antibiotic purchase without prescription. Common antibiotics: amoxicillin, cefixime. Rationale: mild illness, familiarity. Only one pharmacy highlighted antibiotic resistance risks. Overall, 15% of pharmacies did not allow sale of antibiotics without prescription.
Antibiotic Use in Young Adults	2014	Cross-sectional survey in private and public universities, Jakarta.	Students (avg. age 18; non-medical majors).	100	74% self-medicated with antibiotics for cough, cold, sore throat. 91% said pharmacies sold antibiotics without prescription. 55% took advice from parents. 31% requested antibiotics during doctor visits.
Parent Behavior Toward Antibiotics (South Jakarta)	2018	Written questionnaire during seminar.	Parents	90 parents were included but received 68 responses.	95.5% believed reddish throat needs antibiotics. 100% believed green mucus requires antibiotics.
Public Perception of Antibiotics	2021	Online survey via Google Form (shared on social media and webinars).	Parents	443	52% believed antibiotics work for any infection. 74% used antibiotics without doctor's advice. 66.8% bought antibiotics without prescription. 75% agreed to antibiotics for cold to prevent bacterial infection.
Public Knowledge of Antibiotics	2022	Online survey via Google Form.	Public	226 respondents	23% had purchased antibiotics without prescription. 63.7% were prescribed antibiotics in past year for cold/diarrhea. 73.5% followed dosage. 54% believed antibiotics work on common cold.
Public Opinion on Antibiotic Resistance	2023	Online survey via Google Form.	Public	107	49.5% believed antibiotics work for any infection. 32.8% for URTI, 61.7% for diarrhea. 87% willing to contribute to resistance control efforts. 73% would spread awareness to peers and family.

Note: URTI= upper respiratory tract infection, IDR= Indonesian Rupiah, ARI= Acute Respiratory Infection, YOP= Yayasan Orang tua Peduli.

Results

Antibiotic Prescription Patterns in Pediatric Populations

A series of prescription surveys were conducted between 2004 and 2012 to assess antibiotic prescribing practices for pediatric patients in Indonesia (Table 1 and Fig. 1). In 2004, a total of 160 prescriptions provided by doctors for their children's cough and

cold without shortness of breath and watery diarrhea without blood were collected from the parents. The respondents were from the Greater Jakarta area. As compared to public sectors, prescriptions for antibiotics were higher in private sector for both URTI (79% vs. 60%) and diarrhea (78% vs. 44%). In 2006, prescriptions from 123 parents were collected for URTI, diarrhea and fever. A significant increase in antibiotic use for fever with 86.4% of children receiving prescriptions were re-

ported, followed by 74.1% for diarrhea and 54.5% for URTI. Most prescribed antibiotics were cephalosporins (54%), followed by macrolides (20%) and amoxicillin (13%), with smaller proportions of cotrimoxazole and chloramphenicol for cough and cold cases. For non-bloody diarrhea, the most frequently prescribed antibiotics included cotrimoxazole (34%) and cephalosporins (18%), with metronidazole (10%) and other antibiotics such as chloramphenicol, macrolides, and amoxicillin.

A follow-up study conducted between 2008 and 2009 extended the survey beyond Jakarta to cover Central Java, East Java, Bali, Borneo, and Sulawesi. The findings revealed a consistently high rate of antibiotic prescriptions for non-bacterial infections, showing little to no decline over the years. Moreover, the antibiotic prescription rates were higher outside Jakarta compared to the capital city (79.3% vs. 68.2%), highlighting regional disparities in prescribing practices.

In 2012, outpatient clinics recorded 204 antibiotic prescriptions, with the highest proportion for URTI (48%), followed by fever (38%) and diarrhea (14%).

behaviors. Among them, 91% of practitioners prescribed antibiotics for cough, followed by 83% for URTI, and 75% for sore throat. In 2013, a pharmacy survey was conducted using random online sampling among 100 pharmacists in Jakarta. The survey revealed that 85% of pharmacists were willing to dispense antibiotics without a doctor's prescriptions and 43% advised patients to take certain antibiotics for URTI, reflecting a concerning practice that could further contribute to AMR (Figure 2).

Community Prescriptions Patterns of Antibiotic Use

Surveys were also conducted to explore public perceptions and behaviors surrounding antibiotic use (Figure 3). In 2014, a survey was conducted among non-medical students living in boarding houses in Central Jakarta and West Jakarta. The results revealed that many participants had misconceptions about antibiotics that antibiotics were effective against viral infections or could be taken without a doctor's prescription. About 91% of respondents purchased antibiotics without a prescription, showing a high level of

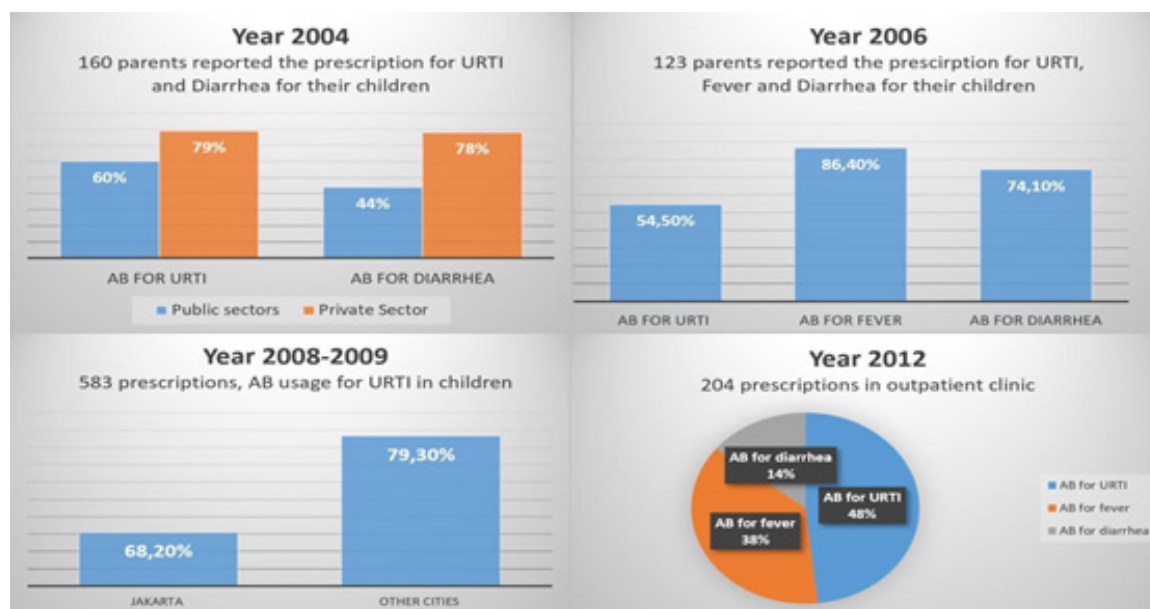


Figure 1. Prescription Survey. Bar Graphs and Pie Chart Show Percentage of Antibiotic Prescribed by Doctors as per the Survey Conducted in (a) 2004, (b) 2006, (c) 2008-2009, and (d) 2012.

Antibiotic Practices Among Healthcare Providers and Pharmacies

In 2010, a survey of 92 general practitioners and pediatricians was conducted in Jakarta to assess their antibiotic prescribing

self-medication. Notably, 74% used antibiotics for URTI. In 2018, an offline survey was conducted among 86 parents with children under five in Greater Jakarta (Jabodetabek). The data revealed that 95.5% used antibiotics

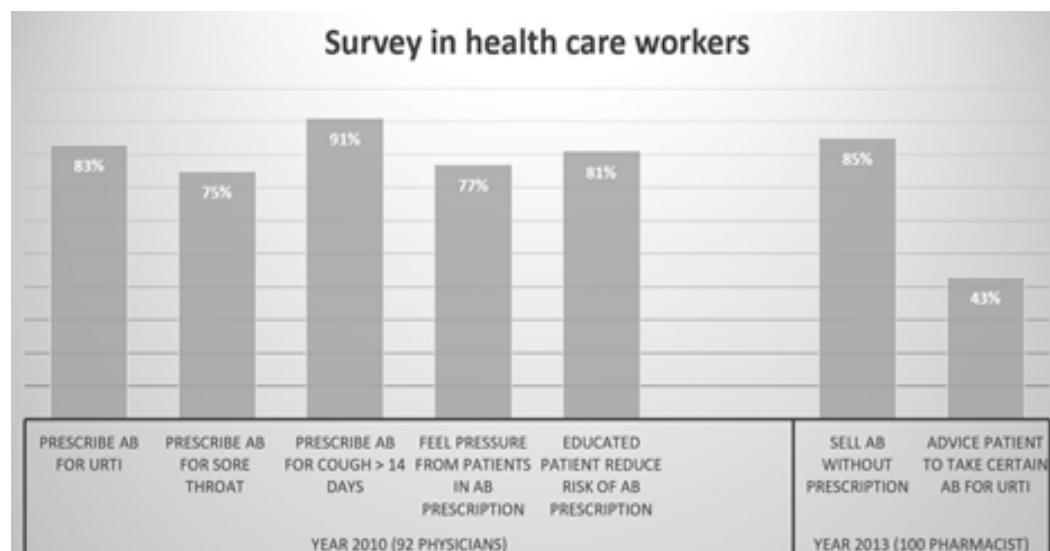


Figure 2. Antibiotic Prescription Trend in Health Care Workers and Pharmacies. Bar Graph Delineates Survey Results Conducted in 2010 and 2013 to Reveal Prescription Trend Followed by Health Care Workers and Pharmacists.

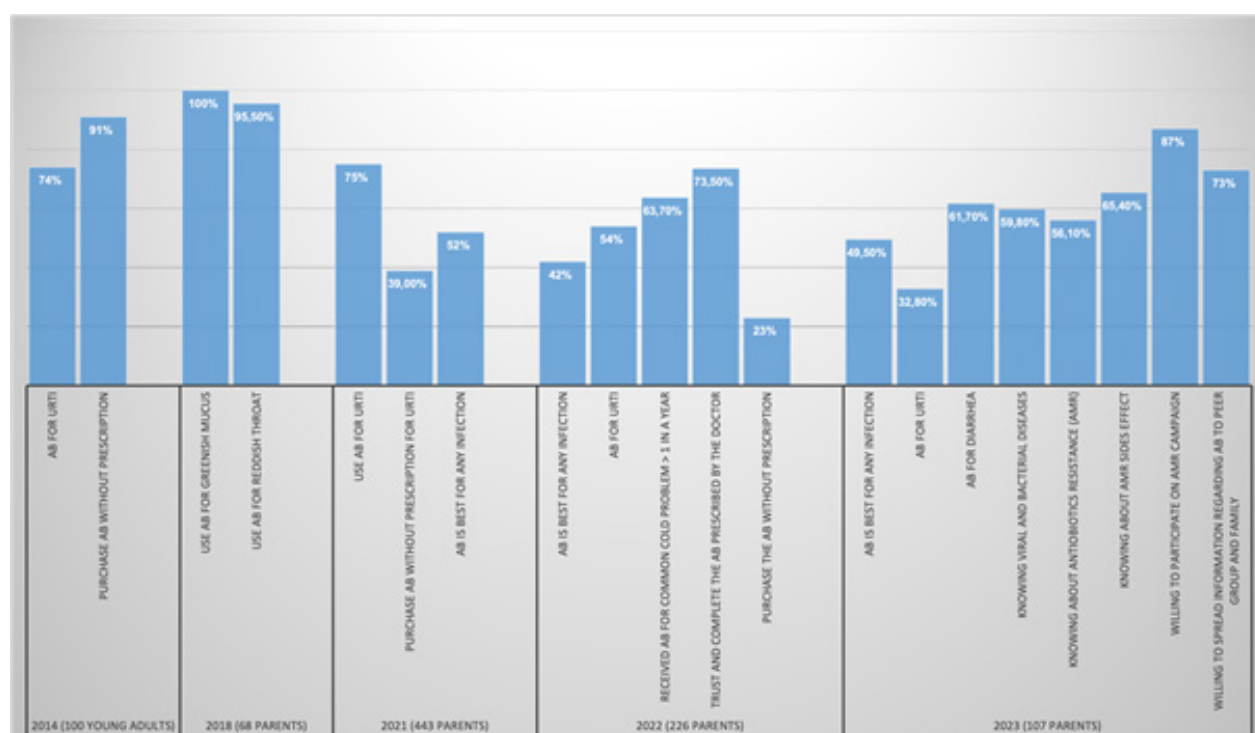


Figure 3. Antibiotic Prescription and Perception in Community. Bar Graph Delineates Different Factors Associated with Antibiotic Prescription and Perception Survey Results from 2014 to 2023.

for a reddish throat, and 100% used them for greenish mucus. Similar with the findings of 2014 survey, a continued gap was observed in knowledge about appropriate antibiotic use.

Further, online surveys were carried out in 2021 (143 respondents), 2022 (226 re-

spondents), and 2023 (107 respondents) via social media platforms such as Facebook and Twitter with different agendas and questions. In 2021, 74 of 143 parents (52%) believed that antibiotics were the best treatment for infections and 75% of parents were using antibiotics

for URTI to prevent bacterial infection. However, the number of parents using antibiotics for URTI without a prescription was 39%. By 2022, a decline in the parents' belief for antibiotic as best treatment for infection was observed 42% (of 226 parents). Moreover, only 23% parents reported purchasing antibiotics without a prescription, showing a significant decline in self-medication. Notably, 73.5% of parents trust antibiotic prescriptions, 63.7% reported taking antibiotics for common health problems more than once a year, and 54% used antibiotics for URTI. In 2023, the survey of 107 parents revealed that 49.5% believed that antibiotics were effective against infections. Among them, 61.7% of parents used antibiotics for diarrhea, and 32.8% continued using them for URTI. Notably, 87% were willing to participate in efforts to provide input to the government and healthcare services regarding antibiotic use, and 73% were ready to spread information about antibiotics within their families and peer groups. The awareness of antibiotic resistance had also increased, with 65.4% understanding its effects, 56.1% knowing about resistance mechanisms, and 59.8% being able to differentiate between viral and bacterial diseases.

Discussion

The irrational use of antibiotics remains a complex and multifaceted issue influenced by perceptions and practicing behaviors of various stakeholders, including healthcare providers, pharmacists, and patients.^{1,15} Since 2005, the Concerned & Caring Parent Foundation-YOP has been actively involved in educating the public regarding the rational use of drugs (such as antibiotics) and patient safety by implementing several interventions including offline and online training sessions and family support through mailing lists.¹⁴ To evaluate the success of the YOP interventions, surveys were conducted that suggest patient-driven antibiotic misuse has decreased however, irrational prescribing behaviors by healthcare professionals and pharmacies have not improved. Despite increasing public awareness regarding antibiotic use, persistent misconceptions and overprescription practices highlight an ongoing challenge.^{16,17}

One of the most concerning findings is the persistent overprescription of antibiotics for viral infections such as coughs, colds, UTRI, fever, and diarrhea.¹⁸ In our study, the survey of general practitioners and pediatricians in Jakarta showed that a significant

proportion continued to prescribe antibiotics irrationally i.e., 83% of them prescribed antibiotics for coughs and colds. Similar trends were observed in other countries such as Iran, where nearly 43% (out of 600) of outpatient antibiotic prescriptions were irrational for coughs and sore throat in 2011/2012.¹⁹ In addition, the most common prescribed medicines were Amoxicillin, Cephalosporins, and Macrolides,¹⁸ which is consistent with our findings. In another study of Depok, Indonesia involving 28 doctors and 788 antibiotic prescriptions, 56.4% of antibiotic prescriptions were found to be inappropriate, with prescribing behaviors influenced by years of practice and exposure to Rational Use of Medicine (RUM) training.²⁰ In contrast, Taxifulati et al. (2021) identified the patterns of antibiotic use and irrational antibiotic prescriptions in primary healthcare institutions (PHIs) in Dongcheng District of Beijing, China and found the antibiotic prescription rate of 4.8% and irrational usage of 11.8%. The difference lies due to the implementation of a series of policies and measures to confront AMR such as restricting antibiotic use and Zero Mark-up Policy.²¹ This suggests that interventions should be targeted at improving prescribing behaviors among healthcare providers through education and policy enforcement.

Pharmacy practices further exacerbate the problem, with an increasing percentage of pharmacies dispensing antibiotics without prescriptions.²² The 2013 simulated client survey revealed that 85% of pharmacies in Jakarta sold antibiotics without a prescription, and 43% recommended antibiotics for UTRI by themselves. This finding aligns with studies from Sudan in 2019 and Pakistan in 2022, where over 90% of pharmacies engaged in similar practices of selling antibiotics over the counter without prescriptions.^{23,24} This is attributed to the lack of stringent regulations, inadequate enforcement of existing policies, and the commercial interests of pharmacies.^{25,26}

Community perceptions play a vital role in irrational antibiotic use.²⁷ Surveys conducted between 2014 and 2023 revealed that although there has been a decline in self-medication and public misconceptions about antibiotics. This may be attributed to the difference in generations, decreased health literacy gaps, digital access through social media, and extensive online health information.²⁸ However, a significant proportion of respondents still believe antibiotics are necessary for viral infections. In concordance with our finding, a

study was conducted in patients from Turkey and Turkish migrants residing in Germany, Sweden, and Netherlands in 2022 to explore experiences and perspectives of physicians and pharmacists on rational antibiotic use. The authors revealed that the physicians and pharmacists encountered irrational use of antibiotics among patients in Turkey and Turkish migrants also expected antibiotic prescription.²⁹ The misconception regarding antibiotic prescription and usage contribute to the risk of antibiotic resistance which can be addressed by sustained educational campaigns, awareness sessions through social media, and training on antibiotic resistance.¹⁷ These efforts must be extended to healthcare providers and pharmacists to create a comprehensive approach to rational antibiotic use.

The COVID-19 pandemic further complicated antibiotic use, as fear and uncertainty led to increased antibiotic consumption often without medical justification.³⁰ Research from Bangladesh demonstrated that antibiotic-seeking behaviors were influenced by factors such as anxiety, perceived illness severity, risk of infection, and mistrust of expert advice during COVID-19.³¹ Overall, the YOP intervention efforts have yielded positive results in patient attitudes toward antibiotic prescriptions.

Limitations

This study has several limitations. First, the data were collected through surveys, which rely on self-reported information and may be subject to biasness or social desirability bias. Second, while the surveys cover a broad geographic area, they may not be entirely representative of Indonesia's diverse population. Thirdly, rural and urban disparities in healthcare access and antibiotic perceptions require further investigation.

Conclusion

Despite increasing awareness among patients regarding antibiotic use, irrational prescribing practices among healthcare providers remain a significant challenge. While self-medication rates have decreased, pharmacies continue to dispense antibiotics without prescriptions, and doctors frequently prescribe antibiotics for viral infections. These issues require a multipronged approach such as strict regulations on antibiotic prescriptions and dispensing, targeted education for healthcare providers, and widespread public aware-

ness campaigns to promote rational antibiotic use in Indonesia.

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