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Correlation between Drug Information Services, Antibiotic Compliance, and Patient Satisfaction: A Cross-sectional Study at Osadha Clinic, Denpasar

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ABSTRACT: Drug information services are an integral part of good pharmacy practice and play a vital role in promoting antibiotic compliance and ensuring treatment success. This study aimed to examine the correlation between drug information services, antibiotic compliance, and patient satisfaction at Osadha Clinic, Denpasar, Bali. A cross-sectional observational study was conducted involving 105 patients, using structured questionnaires and a pharmacist's drug information checklist. Antibiotic compliance was assessed using a 16-item yes/no questionnaire, while patient satisfaction was measured through 22 Likert-scale statements. Validity and reliability were confirmed with an r-table value of $r > 0.361$ ($p < 0.05$), and Cronbach's alpha coefficients of 0.972 for compliance and 0.881 for satisfaction. Pearson correlation analysis demonstrated a significant relationship between drug information services and antibiotic compliance ($r = 0.814$, $p < 0.001$), as well as between drug information services and patient satisfaction ($r = 0.905$, $p < 0.001$). High-quality drug information services (characterized by clarity, accuracy, and comprehensibility) significantlyenhance patient compliance and satisfaction. These findings underscore the importance of strengthening pharmaceutical care to support rational antibiotic use and improve overall healthcare outcomes.

Keywords: antibiotic resistance**;** good pharmacy practices**;** rational therapy**;** primary health care

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INTRODUCTION

Non-communicable diseases (NCDs) are currently one of the most significant global health challenges. Over recent decades, there has been a marked epidemiological transition from infectious diseases to NCDs, such as diabetes mellitus, hypertension, cardiovascular diseases, and cancer (WHO, 2018). Although NCDs are etiologically distinct from infectious diseases, infectious conditions remain prevalent and often coexist with NCDs, leading to extensive antibiotic use in healthcare settings (WHO, 2022; Cook & Wright, 2022).

Antibiotic resistance has emerged as a critical global health threat, characterized by the ability of bacteria to survive exposure to antibiotics that were previously effective. This phenomenon is largely driven by human behavior, particularly the irrational, excessive, and inappropriate use of antibiotics in humans, animals, and agriculture (Salam et al., 2023; Li et al., 2024). The World Health Organization reported that antibiotic resistance directly caused approximately 1.27 million deaths worldwide annually, underscoring the urgency of addressing this issue through rational antibiotic use and improved healthcare practices (WHO, 2022).

In Indonesia, the Ministry of Health has emphasized the rational and prudent use of antibiotics through various policies and guidelines, including strengthening pharmaceutical care services (Kemenkes RI, 2021). One key strategy to prevent antibiotic resistance is optimizing drug information services provided by pharmacists to improve patient understanding and compliance with antibiotic therapy (Kemenkes RI, 2019; Lim et al., 2022). Drug information services are defined as the provision of independent, accurate, comprehensive, and up-to-date information about medications by pharmacists to patients and the public. However, several studies indicate that patient understanding of medication use remains inadequate, increasing the risk of medication errors, non-compliance, and suboptimal therapeutic outcomes (Nugraheni et al., 2025; Mallah et al., 2022).

Patient compliance plays a crucial role in achieving successful treatment outcomes. Poor compliance to antibiotic therapy can result in treatment failure, prolonged illness, increased healthcare costs, and the development of antibiotic resistance (Almomani et al., 2022). Evidence suggests that high-quality drug information services can significantly improve patient compliance and satisfaction. Patient satisfaction itself is an important indicator of healthcare service quality, as satisfied patients are more likely to continue using healthcare services and adhere to treatment recommendations (Alomari & Hamid, 2022).

Research on patient satisfaction also shows mixed outcomes. A previous study reported high satisfaction levels among patients at a community pharmacy (Dwi et al., 2024); however, it was found that patients were still dissatisfied because they experienced long waiting times, especially during peak hours (Larasati & Nurmawaty, 2022).

Previous studies have reported inconsistent findings regarding the implementation and quality of drug information services. Previous study reported that pharmacist counseling in community pharmacies shown excellent results (Widowati et al., 2022). This is because most aspects listed in Minister of Health Regulation No. 73 of 2016, particularly regarding drug information services, have been implemented (Priyoherianto et al., 2024; Dwi et al., 2024). In contrast to these findings, another study showed revealed that drug information provided by pharmacy staff at a hospital pharmacy installation was incomplete.

Despite existing studies examining drug information services, antibiotic compliance, or patient satisfaction separately, there remains a lack of empirical evidence

analyzing the direct correlation between drug information services, antibiotic compliance, and patient satisfaction simultaneously, particularly in primary healthcare clinics. Furthermore, although government policies emphasize strengthening pharmaceutical care to combat antibiotic resistance, real-world implementation and its measurable impact on patient behavior and satisfaction remain underexplored at the clinic level. Therefore, this study addresses this gap by investigating the relationship between drug information services, antibiotic compliance, and patient satisfaction at Osadha Clinic, Denpasar, Bali, providing evidence to support policy implementation and improve pharmaceutical care practices.

METHODS

Type of Study

This study employed a quantitative, observational, cross-sectional analytical design (Wang & Cheng, 2020). Data were collected using consecutive sampling at Osadha Clinic, Denpasar , during February and March of 2025. Osadha Clinic was selected as the study site because it serves a high volume of outpatient visits, particularly patients receiving antibiotic therapy, and has an active pharmaceutical care service that includes drug information provision by pharmacists. These characteristics make the clinic an appropriate setting to evaluate the relationship between drug information services, antibiotic compliance, and patient satisfaction in a primary healthcare context.

Population and Sample

The study population consisted of patients who received oral antibiotic therapy at Osadha Clinic, Denpasar, during the study period. Eligible participants were patients aged ≥18 years; those who were willing to participate and provided informed consent; and patients who were able to communicate well and complete the questionnaires independently.

The exclusion criteria included patients who did not complete the questionnaire fully; patients with cognitive impairment or communication difficulties that could affect understanding of the questionnaire; patients who received topical antibiotics only; and patients who were unwilling to participate or withdrew during the data collection process.

Samples were selected using a consecutive non-random sampling method. The sample size was calculated using the Slovin formula with an assumed margin of error of 10%, resulting in 105 respondents.

Research Instruments

Data collection involved the use of several instruments. A demographic questionnaire was used to collect patient characteristics, including name, adress, age, gender, level of educations, employment status, patient complaints, number of drug prescribed, type of antibiotic, number of tablets, frequency of medication intake, duration of therapy (days), storage and reuse of antibiotics, purchace of antibiotics without a doctor's prescription, and obtaining antibiotics from relatives.

Antibiotic compliance was measured using the Oral Antibiotic Compliance Questionnaire, which consists of 16 dichotomous (yes/no) items (Zulfa & Handayani, 2020). Patient satisfaction was assessed using the Public Health Care Patient Satisfaction Questionnaire, comprising 22 statements rated on a 4-point Likert scale (Ismail et al., 2020). Additionally, a pharmacist drug information service checklist consisting of seven indicators was used to evaluate the completeness of drug information provided to patients (Anggriani et al., 2022).

Validity and Reliability

Instrument validity was confirmed using Pearson's bivariate correlation analysis involving 30 pilot respondents. All items met the validity criteria, with correlation coefficients exceeding the critical r-table value ($r > 036.1$; $p < 0.05$). Reliability was assessed using Cronbach's alpha, yielding values of 0.972 for the compliance questionnaire and 0.881 for the satisfaction questionnaire, indicating excellent internal consistency.

Data Analysis

Data were analyzed using IBM SPSS version 29. Normality were assessed using the Kolmogorov-Smirnov, which showed p-value > 0.05, indicating that the data were normally distributed. Univariate analysis were performed using frequency distribution, while bivariate analysis was conducted using Pearson's correlation test due to the normal distribution of the data. A significance value of $p < 0.05$ was considered to indicate a statistically significant correlation.

RESULT AND DISCUSSION

A total of 105 patients who visted Osadha Clinic were included in the study shown in table 1. The majority of patients were aged 17–25 years (n = 43; 41.0%), and more than half were female (n=56; 53.3%). Most patients had completed secondary education level (n=54; 51.4%) and were employed in the public sector (n = 47; 44.8%). The most frequent clinical complaints leading to antibiotic prescription was fever, cough, runny nose, and sore throat (n = 87; 82.9%). Approximately 40% of prescriptions containesd three different medications. Amoxicillin was the most commonly prescribed antibiotic (n = 90; 85.7%). Most prescriptions consisted of 10 antibiotic tablets (n = 93; 88.6%), administered at a dose of one tablet three times daily (n = 94; 89.5%) for a duration of four days (n = 88; 83.8%).

Table 1. Respondents' characteristics

Characteristics	n (105)	%
Age (years)		
17-25	43	**41.0**
26-35	26	24.8
36-45	21	20.0
46-55	12	11.4
>56	3	2.9
Gender		
Male	49	46.7
Female	56	**53.3**
Education		
Low	2	1.9
Medium	54	**51.4**
High	49	46.7
Work		
Unemployed	5	4.8
Housewife	3	2.9
Student	37	35.2
Public sector	47	**44.8**
Self-Employed	13	12.4
Patient Complaints		
Fever, cough, flu, sore throat	87	**82.9**
Ear pain	5	4.8
Tooth pain	8	7.6
Foot infection	2	1.9
Urinary tract infection	3	2.9

All respondents reported that they never reused leftover antibiotics, never purchased antibiotics without a prescription, and never obtained antibiotics from friends or family members (n= 105; 100% for each item) shown in table 2. Regarding drug information services, 76 patients (72.4%) received services classified as good quality, while 29 patients (27.6%) received poor-quality services. Antibiotic compliance was observed in 74 patients (70.5%), whereas 31 patients (29.5%) were categorized as less compliant. Most respondents (n = 80; 76.2%) reported satisfaction with pharmaceutical services at the clinic, while 25 patients (23.8%) expressed dissatisfaction. Statistical analysis revealed a very strong and significant correlation between drug information services and antibiotic compliance ($r = 0.814$; $p<0.001$), as well as between drug information services and patient satisfaction ($r = 0.905$; $p<0.001$).

Table 2. Antibiotic used

Characteristics	n (105)	%
Number of Drugs in Prescription		
1	2	1.9
2	32	30.5
3	42	**40.0**
4	25	23.8
5	4	3.8
Types of Antibiotics		
Amoxicillin	90	**85.7**
Cefadroxil	9	8.6
Cefixime	3	2.9
Ciprofloxacin	3	2.9
Number of Tablets		
5	1	1.0
6	4	3.8
10	93	**88.6**
12	1	1.0
15	6	5.7
Frequency of Taking Medication		
2x1	11	10.5
3x1	94	**89.5**
Time Interval (Days)		
3	5	4.8
4	88	**83.8**
5	12	11.4
Storing and Reusing Antibiotics		
Ever	0	0
Never	105	**100**
Buying Antibiotics Without a Doctor's Prescription		
Ever	0	0
Never	105	**100**
Asking Relatives for Antibiotics		
Ever	0	0
Never	105	**100**

The findings of this study indicate that antibiotic prescribing practices at Osadha Clinic generally conform to principles of rational drug use. Antibiotics were predominantly prescribed for respiratory-related symptoms, with amoxicillin being the most frequently used agent. This prescribing pattern aligns with national treatment guidelines, as amoxicillin is classified as an Access antibiotic and recommended as first-line therapy for

common infections (Kemenkes RI, 2021). The consistency observed in dosage, frequency, and duration further suggests compliance by prescribers to standardized protocols.

Patient behavior regarding antibiotics also reflected rational use, as no one reported self-medication, sharing antibiotics, or reusing leftover antibiotics. This behavior indicates a relatively high level of awareness regarding appropriate antibiotic practices, likely a result of the provision of drug information in the clinic. This behavior differs from previous research, which found that misconceptions about antibiotic use persist (Sinuraya et al., 2023).

Although most patients received good-quality drug information services, more than a quarter experienced suboptimal counseling, this finding is consistent with previous studies from other primary and secondary healthcare facilities, which showed that limitations in service delivery, such as time constraints, staff shortages, and high patient loads, remain common challenges (Nida et al., 2024). These factors can limit pharmacists' ability to provide comprehensive counseling to every patient. Only a small proportion of community pharmacists receive incentives to provide drug information services; therefore, funding for drug information services could improve the quality and sustainability of pharmacy services in the community (Bahar et al., 2025).

Patient compliance with antibiotics was generally high; however, nearly one-third of respondents were classified as non-compliant shown on table 3. The main reasons for noncompliance included feeling better, forgetting, misunderstanding instructions, and concerns about side effects . This finding is in line with previous studies that non-compliance is multifactorial and closely related to patient understanding of therapy, emphasizing the importance of effective communication during the delivery of drug information (Widowati et al., 2022)(Sinuraya et al., 2023).

The primary contribution of this study is the identification of a strong positive relationship between drug information services and antibiotic compliance. These results align with previous research that underscores the crucial role of pharmacists in improving compliance through clear and comprehensive counseling (Widowati et al., 2018). Effective drug information improves patient understanding of the purpose and importance of completing antibiotic therapy, thereby reducing inappropriate behaviors such as premature discontinuation.

Table 3. Drug information service quality, antibiotics compliance, and patients' satisfaction

Drug Information Services	**n**	**%**
Good	76	**72.4**
Poor	29	27.6
Antibiotic Use Compliance	**n**	**%**
Compliant	74	**70.5**
Less Compliant	31	29.5
Patients' Satisfaction	**n**	**%**
Satisfied	80	**76.2**
Not Satisfied	25	23.8

A strong relationship was found between drug information services and patient satisfaction shown in table 4. These findings suggest that patient satisfaction is strongly influenced by interpersonal aspects of care, including clarity of explanation, empathy, and patient involvement in the treatment process (Yuliani et al., 2024). For patients covered by national health insurance, who often rely on pharmacists for medication-related guidance,

high-quality drug information services play a crucial role in shaping positive perceptions of healthcare quality (Wardani et al., 2024).

Overall, the results suggest that rational antibiotic use, patient compliance, and satisfaction are interconnected outcomes that are strongly influenced by the quality of drug information services. Strengthening pharmacist-led counseling should therefore be considered a strategic component of pharmaceutical care, with implications for improving therapeutic outcomes, enhancing patient experience, and supporting antimicrobial stewardship initiatives.

Table 4. The relationship between drug information services, antibiotics compliance, and patients' satisfaction

		Drug Information Services	**Antibiotic Compliance**	**Patients' Satisfaction**
Drug Information Services	Pearson Correlation	1	0.814	0.905
	Sig. (2-tailed)	-	<0.001	<0.001
Antibiotics Compliance	Pearson Correlation	0.814	1	0.766
	Sig. (2-tailed)	<0.001	-	<0.001
Patients' Satisfaction	Pearson Correlation	0.905	0.766	1
	Sig. (2-tailed)	<0.001	<0.001	-

This study has several limitations. First, the use of a cross-sectional design limits the ability to establish causal relationships between variables. Second, data on antibiotic compliance and satisfaction were self-reported by patients, which may be subject to recall bias or social desirability bias. Third, the use of concecuitive non-random sampling may limit the generalizability of the findings to broader populations. In addition, the study was conducted in a single clinic setting, which may not reflect practices in other healthcare facilities or regions. Therefore, future studies employing randomized sampling methods and multi-center designs are recommended to validate and expand upon these findings.

The results support national policies promoting rational antibiotic use and AMR control. Integrating standardized drug information services into routine pharmaceutical care, especially in primary healthcare clinics serving national health insurance patients, can help ensure consistent and high-quality service delivery aligned with government regulations. Overall, the study reinforces the importance of strengthening pharmaceutical care services as a strategic approach to improving treatment outcomes and supporting antimicrobial stewardship efforts.

CONCLUSION

This study concludes that high-quality drug information services significantly contribute to improved patient compliance with antibiotic use and higher levels of patient satisfaction. The strong positive correlations observed between drug information services and both antibiotic compliance and patient satisfaction underscore the pivotal role of pharmacists in promoting rational drug use, particularly in primary care settings. Pharmaceutical care that incorporates comprehensive, clear, and patient-centered communication has the potential to enhance treatment outcome and reducethe risk of antibiotic resistance. As a practical recommendation, pharmacists and clinic management

are encouraged to standardize and strengthen drug information services by allocating adequate counseling time, enhancing communication skills through continuous training, and implementing clear guidelines for antibiotic counseling. These efforts may further improve patient compliance, satisfaction, and overall quality of pharmaceutical care.

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AUTHORS CONTRIBUTION

KA: Study concept; study design; literature search; data collections; data analysis; data interpretation; manuscript preparation.
RW: Study design; data analysis; final data interpretation; final manuscript; submitting manuscript.
MA: Literature search; framework study.
RA: Framework study; manuscript review.
PS : Data interpretation; final manuscript.

ETHICS APPROVAL

This study received ethical clearence from the ethic committee of Bali International University number 02.0505/UNBI/EC/III/2025 with served as the foundation for conducting the study.

CONFLICT OF INTEREST

The authors declare there is no conflict of interest in this study.

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