Original Article

Minding the gap: Assessing patient expectations versus experiences in drug information services at community health centers (*Puskesmas*) in Indonesia urban settings

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Abstract

In pharmaceutical care, patients' perceptions of drug information provided by pharmacists are vital for assessing pharmaceutical services at community health centers (in Indonesian known as *Puskesmas*). The aim of this study was to determine the alignment between patients' expectations and experiences of drug information services by pharmacists at *Puskesmas* in Indonesia. This multicenter cross-sectional study utilized a validated questionnaire among outpatient patients aged 18 years and above across all 47 *Puskesmas* in Makassar, Indonesia. A total of 622 respondents were interviewed between September to December 2023. Significant gaps were observed between patients' expectations and experiences regarding all the drug information aspects such as quantity (median: 4 vs 3, $p<0.001$), drug effects (median: 4 vs 3, $p<0.001$), dosage form (median: 3 vs 3, $p<0.001$), proper administration (median: 4 vs 4, $p<0.001$), side effects (median: 4 vs 2, $p<0.001$), storage (median: 3 vs 2, $p<0.001$), drug-drug interactions (median: 4 vs 2, $p<0.001$), drug-food interactions (median: 4 vs 2, $p<0.001$), handling missed dose (median: 3 vs 2, $p<0.001$), managing accidental overdoses (median: 4 vs 2, $p<0.001$), history of drug use (median: 3 vs 2, $p<0.001$), co-medications (median: 3 vs 2, $p<0.001$), and previous drug allergies (median: 3 vs 2, $p<0.001$). Sociodemographic factors influencing patients' need for drug information services encompass age, sex, educational attainment, comorbidities, family size, number of visits, monthly income, and occupation. The quality of drug information services at *Puskesmas* in Indonesia still requires optimization and customization to meet the specific needs of patients, taking into account their sociodemographic characteristics.

Keywords: Drug information service, pharmacy service, pharmaceutical care, patient perception, patient satisfaction

Introduction

*I*ndonesia's community health centers, known as *Puskesmas*, are the backbone of the nation's primary healthcare system. Strategically located within communities, *Puskesmas* offer essential services, with pharmaceutical care playing a central role [1]. Highly trained pharmaceutical personnel directly manage this care, ensuring patients receive medication-related services, optimizing their treatment, and improving their quality-of-life. A vital aspect of this care is drug

information services (DIS) [2]. DIS empowers *Puskesmas* pharmacists to act as a vital information hub. Their primary function is to provide accurate, unbiased, and current medication information to doctors, nurses, and other healthcare professionals, as well as directly to patients themselves [3].

Effective communication skills are substantial for *Puskesmas* pharmacists offering DIS. Patient-centered communication builds trust and satisfaction and, ultimately, leads to better health outcomes [4]. In the context of pharmaceutical care, the patient's experiences of the quality of drug information provided by pharmaceutical personnel serves as a crucial indicator for evaluating and enhancing pharmaceutical services at *Puskesmas* [5]. Therefore, to optimize this experience, pharmacists must tailor their communication approach to each patient's needs.

The role of pharmacists in developing countries such as Indonesia remains critical, particularly because patients often face challenges in effectively communicating during medication information services. Identifying gaps between patient expectations and their experiences in DIS is essential to address emerging issues related to communication during medication information provision, thereby understanding treatment from the patient's perspective and supporting engagement in the treatment process. Effective communication in providing optimal drug information can enhance patient satisfaction and ultimately optimize treatment outcomes [4,6].

According to Indonesia's Ministry of Health Regulation (Permenkes No. 74/2016), pharmaceutical personnel in Indonesia are mandated to provide patients with DIS on various aspects of drug usage. However, patient-to-pharmacist ratios at *Puskesmas* often deviate from optimal staffing levels, restricting pharmacists' time to fully explain all essential drug information to patients. Additionally, the information needs of patients can vary, and the scope of information should be tailored accordingly. For example, patients on refilled medications or those not requiring specialized administration techniques may benefit from more concise explanations.

This study evaluated the disparity between patients' expectations and their experiences with DIS at *Puskesmas* to bridge this gap and improve the quality of pharmaceutical services. By understanding and addressing these discrepancies, it is possible to enhance the overall quality of pharmaceutical services at *Puskesmas* in Indonesia.

Methods

Study design and setting
This study employed a multi-center cross-sectional design, utilizing a validated survey instrument to collect data from patients visiting *Puskesmas* in Makassar, Indonesia, between September and December 2023. Makassar serves as the capital city of South Sulawesi Province, Indonesia, positioned between 119º24'17'38" east longitude and 5º8'6'19" south latitude. The total area of Makassar spans 175.77 square kilometers [7]. Administratively, Makassar is divided into 15 sub-districts comprising 153 villages. There are 47 *Puskesmas* distributed across Makassar [7].

Data collection
This study included patients aged 18 years and older who were outpatient attendees at the *Puskesmas* in Makassar. Questionnaires were distributed directly to participants before and after receiving DIS at the *Puskesmas*. Data collection was anonymous, and the information was transferred to electronic form for analysis. The data were stored in a secure database accessible only to the research team to ensure participant confidentiality.

Study instrument development
The research questionnaire was developed and adapted from the survey instrument utilized by Kim *et al.* [8] to assess patients' experiences with DIS at community pharmacies in South Korea. A two-step translation process was employed to ensure the accuracy and cultural appropriateness of the questionnaire for the Indonesian population. First, two independent translators fluent in English and Bahasa Indonesia created forward translations of the source language questionnaire. Next, two professional translators proficient in both languages performed backward translations,

converting the Bahasa Indonesia version to English. This process ensured the compatibility and consistency of the translated instrument [9]. The questionnaire items were adapted to the Indonesian context by referencing the Pharmaceutical Service Standards at *Puskesmas* outlined in Indonesia's Ministry of Health Regulation Number 74 of 2016 [3]. Following adaptation, the questionnaire was reviewed by a panel of three experts: two pharmacists specializing in pharmaceutical care and one psychometric expert.

Study instrument structure

The questionnaire comprised four sections as adopted from the previous study [8]. The first section collected patients' sociodemographic data relevant to the study's objectives, including age, gender, family size, education level, employment status, frequency of *Puskesmas* visits in the past three months, number of chronic conditions, and income level. The second section focused on patients' expectations of information provided and sought during pharmaceutical services at *Puskesmas*. This encompassed details regarding medication quantity and dosage form, expected drug effects and potential side effects, proper administration instructions and storage guidelines, potential interactions with other medications and food, handling missed doses, and managing accidental overdoses. Additionally, the section explored whether patients expected pharmacists to inquire about their current medication use and any history of drug allergies. The third section mirrored the second section's information categories, but instead of expectations, it focused on patients' actual experiences with DIS at *Puskesmas*. It used statements related to information provided to and requested from patients regarding medication details (as outlined in section 2). The fourth section evaluated patients' perceptions of pharmaceutical services provided by pharmaceutical personnel at the *Puskesmas*. The aspects include a friendly and professional attitude, the use of language that is easy to understand, information about the drugs used, ensuring that patients understand the drug information provided, sufficient time to communicate with patients, the atmosphere and environment of the pharmacy (drug collection room), and availability of a private consultation space. Responses in sections 2, 3, and 4 were rated on a Likert scale. For sections 2 and 3, respondents indicated their agreement with statements using a range of options from "strongly disagree" (score 1) to "strongly agree" (score 4). Section 4 used a scale ranging from "Very poor" (score 1) to "excellent" (score 4) [8].

Study instrument testing and validation

To ensure clarity and minimize errors, the revised questionnaire underwent pilot testing with a randomly selected group of ten participants from the target population [10]. These participants provided feedback on the clarity and accuracy of each questionnaire item. Their suggestions were incorporated to refine the instrument before the main study commenced. In the validation stage, the number of participants adhered to the principle of 1:10, which stipulates that 10 participants are needed for each questionnaire item [10].

The internal validity test was conducted to assess the internal consistency of the second and third sections of the questionnaire, which measured patients' expectations and experiences with DIS, respectively. The questions in these sections were tailored to align with the Pharmaceutical Service Standards at *Puskesmas*, as outlined in Indonesia's Ministry of Health Regulation Number 74 of 2016, regarding drug information items that must be conveyed to patients. Consequently, the second and third sections of the questionnaire represent standardized constructs.

The internal validity test employed Pearson's correlation coefficient, a statistical measure that evaluates the strength and direction of the linear relationship between individual questions and the total score for each section. The total score represented the sum of all item responses within a section. A statistically significant correlation, indicated by a *p*-value less than 0.05, suggested that an individual question aligned with the overall construct being measured, in this case, patients' expectations and experiences with DIS. Therefore, questions demonstrating a significant correlation were considered to contribute to measuring the intended construct.

The validity of the fourth questionnaire section, measuring patient experiences with pharmaceutical services, was assessed using confirmatory factor analysis (CFA). CFA is a statistical technique that helps identify underlying factors that explain the relationships between multiple variables. In this case, we aimed to identify a single factor representing patients'

experiences with pharmaceutical services. To ensure the suitability of CFA for this section, the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and Bartlett's test of sphericity were conducted. A KMO value above 0.7 and a $p<0.05$ from Bartlett's test indicate that the data is appropriate for CFA [11,12].

Validity was evaluated using two measures: convergent validity and discriminant validity. Convergent validity pertained to a high level of correlation among the variables included in one factor. The factor loadings of at least 0.4 were considered acceptable, as recommended previously [13]. Discriminant validity refers to the degree to which the measured factors are distinct and do not significantly correlate. The correlations between factors were considered acceptable if they did not surpass 0.85, as stated previously [14].

Following the application of CFA to assess the validity of the fourth questionnaire section, several statistical indices were employed to evaluate the model's fit. These indices included the comparative fit index (CFI), Tucker-Lewis index (TLI), and root mean square error of approximation (RMSEA) for model fit. CFI and TLI values greater than 0.92 were considered a good fit between the model and the data, while a lower RMSEA value below 0.08 was considered a close fit, as recommended previously [12]. Additionally, Cronbach's alpha coefficient was calculated to assess the questionnaire's reliability of which a Cronbach's alpha value of 0.6 or higher was considered acceptable [15].

Sample size and sampling method

This study included all *Puskesmas* (n=47) in Makassar. According to data from the Central Bureau of Statistics, the population of Makassar as of 2023 was 1,436,626 [16]. Therefore, the minimum sample size required, based on the Slovin formula [17], with a margin of error of 5%, was determined to be 400 people. A minimum of ten patients from each *Puskesmas* were recruited in this study using the convenience sampling method.

Statistical analysis

Since Likert scale responses for expectations and experiences were treated as continuous data and were not normally distributed, they were presented as medians and interquartile ranges (IQRs). To explore the gap between what patients expected and what they experienced with DIS, the difference between median expectation and experience scores for each information category was calculated. The Wilcoxon signed-rank test was used to assess the significance of these differences between expectations and experiences. Multivariate linear regression analysis with the enter method was employed to explore factors influencing patients' expectations of DIS and the disparity between patients' expectations and actual experiences of DIS. A $p<0.05$ was considered the threshold for indicating a significant difference or relationship.

Results

Validation test of questionnaire

Characteristics of participants used in the validation test of questionnaire were comparable to those used in the main analysis (see **Underlying data**). In the assessment of internal test validity, two primary domains: patient expectations and perceptions, each item exhibited a significance value of less than 0.01, thus affirming their validity and permitting the utilization of the questionnaire. The KMO measure of sampling adequacy and Bartlett's Test of Sphericity values are 0.89 and $p<0.001$, respectively. All goodness-of-fit parameters achieved the desired thresholds: CFI at 0.92, TLI at 0.92, RMSEA at 0.08, and SRMR at 0.08.

The factor loadings of the perceived pharmaceutical service domain ranged from 0.46 to 0.59, indicating the strength of the relationship between each question and the underlying construct (patient perceptions). The questionnaire reliability test showed that the patient expectations of DIS domain, patient experience of DIS domain, and the patient perception of pharmaceutical services domain had Cronbach's alpha values of 0.839, 0.864, and 0.92, respectively. All domains achieved Cronbach's alpha value exceeding 0.60, indicating an acceptable reliability level. This finding suggests that the items within each domain measure a similar underlying construct and support the questionnaire's suitability for data collection in this

study. Detailed results of the validation test of questionnaire are presented in the **Underlying data**.

Characteristics of *Puskesmas*

All 47 *Puskesmas* in Makassar were included in this study. The distribution of the recruited sample across the 47 *Puskesmas* in Makassar City is visualized in **Figure 1**. Out of these, 42.6% had primary accreditation, and more than half (over 50%) had two pharmacists on staff. Over 60% of the *Puskesmas* employed only one pharmacy technician. Most (80.9%) offered outpatient services, and 55.3% typically received a daily influx of 51–100 patients (**Table 1**).
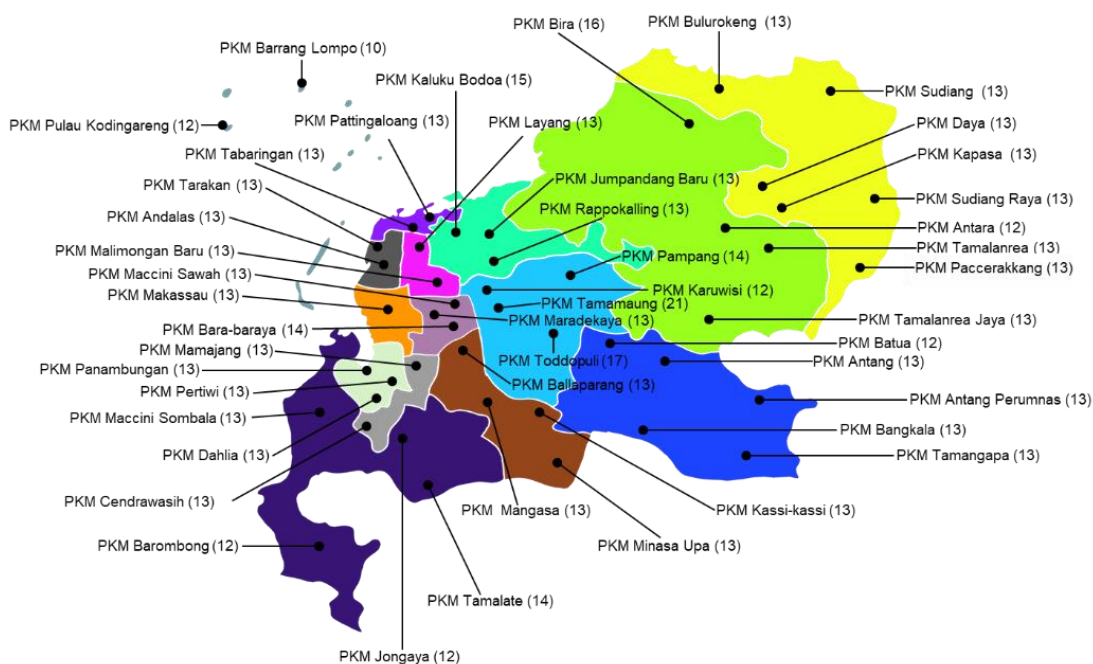

Figure 1. Distribution map of respondents sampled from 47 *Puskesmas* in Makassar during the study. PKM stands for *Puskesmas*.

Table 1. Characteristics of *Puskesmas* included in the study (n=47)

Characteristics of *Puskesmas*	Frequency (percentage)
Puskesmas accreditation	
Not accredited/basic (*Dasar*)	7 (14.9)
Intermediate (*Madya*)	17 (36.2)
Primary (*Utama*)	20 (42.6)
Complete (*Paripurna*)	3 (6.4)
Number of pharmacy technician	
No one	5 (10.6)
1 person	31 (66)
2 people	9 (19.1)
3 people	1 (2.1)
4 people	1 (2.1)
Number of pharmacist(s)	
1 pharmacist	22 (46.8)
2 pharmacists	24 (51.1)
3 pharmacists	0 (0.0)
4 pharmacists	1 (2.1)
Type of *Puskesmas* care	
Outpatient	38 (80.9)
Outpatient and inpatient	9 (19.1)
Number of patient visits per day	
1–50 patients	14 (29.8)
51–100 patients	26 (55.3)
>100 patients	7 (14.9)

Characteristics of participants

Out of the 622 participants involved in this study, 76.2% were female, and the majority fell within the age range of 18–30 years (44.9%). Additionally, 87.8% of respondents came from families of at least three members, and 76% had completed ≤12 years of education. Furthermore, a significant proportion of patients were unemployed (71.2%), and 51.3% had made only one visit in the last three months. Regarding health conditions, 67.5% of patients reported having only one type of disease, while approximately only 12% had an income exceeding IDR 3,500,000 per month (**Table 2**).

Table 2. Respondent characteristics (n=622)

Respondent characteristics	Frequency (Percentage)
Sex	
Male	148 (23.8)
Female	474 (76.2)
Age	
18–30 years	279 (44.9)
31–50 years	230 (37)
>50 years	113 (18.2)
Number of families	
1–2 people	76 (12.2)
≥3 people	546 (87.8)
Length of education	
≤12 years	473 (76)
>12 years	149 (24)
Jobs	
Unemployed	443 (71.2)
Employed	179 (28.8)
Number of visits in the last three months	
1 time	319 (51.3)
2 times	141 (22.7)
≥3 times	162 (26)
Number of diseases	
1 disease	420 (67.5)
>1 disease	202 (32.5)
Monthly income (Indonesian Rupiah, IDR)	
<1,000,000	271 (43.6)
1,000,000–3,500,000	273 (43.9)
>3,500,000	78 (12.5)

Patient's expectations and experiences towards drug information services

The expectation and experience scores regarding DIS are presented in **Table 3**. The results indicate that the majority of patients agreed (score 3) on the importance of receiving information regarding drug dosage forms (median: 3, IQR: 1), storage guidelines (median: 3, IQR: 1), handling missed doses (median: 3, IQR: 1), and inquiries regarding drug use history (median: 3, IQR: 1), comedications (median: 3, IQR: 1), and drug allergy history (median: 3, IQR: 1). Furthermore, most patients strongly agreed (score 4) on the necessity of receiving drug information regarding the quantity of drugs (median: 4, IQR: 1), expected effects (median: 4, IQR: 1), proper administration (median: 4, IQR: 1), potential side effects (median: 4, IQR: 1), drug-drug interactions (median: 4, IQR: 1), drug-food interactions (median: 4, IQR: 1), and overdose management (median: 4, IQR: 1). However, a significant gap existed between their expectations and actual experiences. The majority of patients disagreed with receiving information about side effects (median: 2, IQR: 1), storage guidelines (median: 2, IQR: 2), drug-drug interactions (median: 2, IQR: 1), drug-food interactions (median: 2, IQR: 1), handling missed doses (median: 2, IQR: 2), and overdose management (median 2, IQR: 2). Additionally, most patients disagreed with the statement that pharmaceutical personnel inquire about drug use history (median: 2, IQR: 1), current medication usage (median: 2, IQR: 1), and drug allergy history (median: 2, IQR: 1). **Table 3** presents a detailed gap analysis between expectations and experiences regarding DIS. It reveals a significant disparity between patients' expectations and actual experiences across all drug information items.

Table 3. Patients' expectations and actual experiences on drug information services at *Puskesmas*

Item	Expectations		Experiences		Gap median (Q1, Q3)	*p*-value
	Total Score	Median (Q1, Q3)	Total Score	Median (Q1, Q3)		
Medication quantity	2119	4 (3, 4)	1974	3 (3, 4)	0 (0, 1)	<0.001*
Expected drug effects	2200	4 (3, 4)	1959	3 (3, 4)	0 (0, 1)	<0.001*
Dosage form	1959	3 (3, 4)	1786	3 (2, 4)	0 (0, 1)	<0.001*
Proper administration instructions	2250	4 (3, 4)	2168	4 (3, 4)	0 (0, 0)	<0.001*
Potential side effects	2148	4(3, 4)	1476	2 (2, 3)	1 (0, 2)	<0.001*
Storage guidelines	1909	3 (3, 4)	1420	2 (1, 3)	1 (0, 2)	<0.001*
Potential drug-drug interactions	2101	4 (3, 4)	1448	2 (2, 3)	1 (0, 2)	<0.001*
Potential drug-food interactions	2100	4 (3, 4)	1398	2 (2, 3)	1 (0, 2)	<0.001*
Handling missed dose	2052	3 (3, 4)	1255	2 (1, 3)	1 (0, 2)	<0.001*
Managing accidental overdoses	2052	4 (3, 4)	1237	2 (1, 3)	1 (0, 2)	<0.001*
History of drug use	1909	3 (3, 4)	1493	2 (2, 3)	1 (0, 1)	<0.001*
Co-medication	1911	3 (3, 4)	1434	2 (2, 3)	1 (0, 1)	<0.001*
History of drug allergies	1904	3 (3, 4)	1474	2 (2, 3)	1 (0, 1)	<0.001*

*Statistically significant at *p*=0.05

Factors associated with patients' expectations of drug information services at *Puskesmas*

Compared to other age groups, patients aged 31–50 expect to receive information regarding the amount of medication (β=0.13; 95%CI: 0.06, 0.33) and expected drug effects (β=0.10; 95%CI: 0.03, 0.26) (**Table 4**). In contrast, patients over 50 were less likely to value information on storage guidelines, drug interactions (both drug-drug and drug-food), and inquiries about their co-medications and history of drug allergies. Patients with more than 12 years of education showed a stronger preference for understanding the expected effects of their medications (β=0.16; 95%CI: 0.11, 0.38) (**Table 4**).

Table 4. Final model of the relationship between patient sociodemographic characteristics and patient expectations of drug information services at *Puskesmas*#

Items	Variables	β	95%CI	Adjusted R^2	*p*-value
Medication quantity	Age 31–50 years	0.13	0.06, 0.33	0.01	0.004*
Expected drug effects	Age 31–50 years	0.10	0.03, 0.26	0.04	0.017*
	Length of education >12 years	0.16	0.11, 0.38		<0.001*
	Number of diseases >1	0.11	0.03, 0.27		0.011*
	Number of visits 2 times	-0.09	-0.27, -0.01		0.039*
	Number of visits ≥3 times	-0.10	-0.29, -0.03		0.018*
Dosage form	Female	0.11	0.06, 0.41	0.01	0.008*
Proper administration instructions	NA	NA	NA	NA	NA
Potential side effects	Number of visits 2 times	-0.12	-0.36, -0.06	0.004	0.006*
	Number of visits ≥3 times	-0.12	-0.36, -0.06		0.006*
Storage guidelines	Age >50 years	-0.14	-0.55, -0.12	0.03	0.003*
	Number of diseases >1 disease	0.10	0.05, 0.38		0.012*
	Number of visits 2 times	-0.08	-0.38, -0.002		0.048*
	Number of visits ≥3 times	-0.13	-0.46, -0.09		0.004*
Potential drug-drug interactions	Female	0.08	0.003, 0.31	0.06	0.046*
	Age >50 years	-0.21	-0.61, -0.25		<0.001*
	Family size >3 people	0.08	0.013, 0.40		0.036*
	Number of diseases >1 disease	0.13	0.08, 0.36		0.002*
Potential drug-food interactions	Age >50 years	-0.11	-0.40, -0.04	0.03	0.019*
	Family size >3 people	0.09	0.02, 0.40		0.033*
	Number of visits ≥3 times	-0.09	-0.31, -0.01		0.042*

Items	Variables	β	95%CI	Adjusted R^2	p-value
Handling missed dose	Number of diseases >1 disease	0.10	0.04, 0.33	0.02	0.006*
	Income <IDR 1,000,000	-0.13	-0.38, -0.06		0.006*
Managing accidental overdoses	Number of diseases >1 disease	0.12	0.06, 0.37	0.03	0.006*
	Income <IDR 1,000,000	-0.16	-0.45, -0.12		0.001*
	Number of visits 2 times	-0.09	-0.36, -0.01		0.036*
History of drug use	Number of diseases >1	0.12	0.07, 0.39	0.01	<0.001*
	Income <IDR 1,000,000	-0.10	-0.36, -0.10		0.006*
Co-medication	Age >50 years	-0.15	-0.58, -0.14	0.05	0.001*
	Unemployed	-0.10	-0.43, -0.01		0.041*
	Income <IDR 1,000,000	-0.17	-0.50, -0.14		<0.001*
History of drug allergies	Age >50 years	-0.13	-0.57, -0.11	0.05	0.003*
	Unemployed	-0.12	-0.47, -0.04		0.022*
	Income <IDR 1,000,000	-0.20	-0.58, -0.21		<0.001*

NA: not available
#Using the enter method, in which all variables were included in the final models and only significant variables are presented in the table
* Statistically significant at p=0.05

Patients with comorbidities expressed a greater desire for information on various aspects of their medications, including expected effects (β=0.11; 95%CI: 0.03, 0.27), storage guidelines (β=0.10; 95%CI: 0.05, 0.38), potential drug interactions (both drug-drug and drug-food), handling missed doses, and managing accidental overdoses (**Table 4**). They also preferred pharmacy personnel to inquire about their drug use history (β=0.12; 95%CI: 0.07, 0.39) (**Table 4**).

Compared to males, females showed a greater interest in understanding drug dosage forms (β=0.11; 95%CI: 0.06, 0.41) and potential drug-drug interactions (β=0.08; 95%CI: 0.003, 0.31) (**Table 4**). Patients in households with at least three members were more likely to value information on drug-drug (β=0.08; 95%CI: 0.013, 0.40) and drug-food interactions (β=0.09; 95%CI: 0.02, 0.40). Patients who visited *Puskesmas* more frequently (two or three times in the last three months) showed less interest in information about expected effects, side effects, storage guidelines, overdose management, and potential drug-food interactions compared to those who visited only once (**Table 4**).

Patients with a monthly income of less than IDR 1,000,000 were less interested in information on managing missed doses, overdoses, and inquiries regarding their medication history, co-medications, and drug allergies (**Table 4**). Similarly, unemployed patients expressed a lower preference for information on comedications (β=-0.10; 95%CI: -0.43, -0.01) and inquiries about drug allergy history (β=-0.12; 95%CI: -0.47, -0.04) (**Table 4**).

Table 5. Relationship between the sociodemographic characteristics and the gap between expectations and experiences of drug information services at *Puskesmas#*

Item	Variables	β	95%CI	Adjusted R^2	p-value
Amount of medicine	Income >IDR 3,500,000	0.11	0.05, 0.47	-0.000186	0.015*
Effects of drug(s)	Age >50 years	-0.10	-0.48, -0.04	0.03	0.021*
	Number of visits 2 times	-0.13	-0.50, -0.11		0.002*
	Number of diseases >1	0.10	0.02, 0.36		0.026*
Drug formulation	Family size 1–2 people	-0.09	-0.55, -0.02	0.01	0.036*
How to use the medicine	NA	NA	NA	NA	NA
Side effects	Age >50 years	0.15	0.17, 0.67	0.05	0.001*
	Length of education >12 years	0.12	0.09, 0.54		0.006*
	Number of visits 2 times	-0.12	-0.55, -0.11		0.004*
	Number of visits ≥3 times	-0.12	-0.53, -0.10		0.005*
Drug storage	Age >50 years	0.11	0.06, 0.57	0.04	0.016*

Item	Variables	β	95%CI	Adjusted R^2	p-value
	Length of education >12 years	0.10	0.04, 0.50		0.020*
	Number of visits ≥3 times	-0.18	-0.68, -0.25		<0.001*
Drug-drug interactions	Number of visits 2 times	-0.13	-0.54, -0.12	0.02	0.002*
	Number of visits ≥3 times	0.14	-0.54, -0.12		0.002*
	Income <IDR 1,000,000	0.11	-0.43, -0.03		0.025*
Drug-food interactions	Number of visits ≥3 times	-0.13	-0.54, -0.11	0.02	0.004*
	Income <IDR 1,000,000	-0.12	-0.49, -0.07		0.010*
How to manage missed dose	Age >50 years	0.09	0.01, 0.52	0.01	0.041*
	Number of visits ≥3 times	-0.10	-0.46, -0.03		0.026*
	Income <IDR 1,000,000	-0.10	-0.42, -0.01		0.043*
How to manage overdose	Age 31–50 years	0.11	0.05, 0.45	0.03	0.013*
	Age >50 years	0.11	0.07, 0.59		0.012*
	Number of visits 2 times	-0.12	-0.56, -0.11		0.004*
	Number of visits ≥3 times	-0.12	-0.53, -0.09		0.006*
	Income <IDR 1,000,000	-0.12	-0.49, -0.07		0.010*
History of drug use	Age >50 years	0.11	0.06, 0.58	0.01	0.018*
	Duration of education >12 years	0.09	0.02, 0.48		0.036*
Co-medication	Duration of education >12 years	0.12	0.07, 0.47	0.03	0.009*
	Number of visits 2 times	-0.09	-0.40, -0.01		0.042*
	Income <IDR 1,000,000	-0.10	-0.37, -0.003		0.047*
Previous drug allergies	Length of education >12 years	0.11	0.06, 0.50	0.02	0.012*
	Income <IDR 1,000,000	-0.14	-0.50, -0.10		0.004*

NA: not available
#Using the enter method, in which all variables are included in the final models, only significant variables were displayed
*Statistically significant at p=0.05

The relationship between patients' sociodemographic characteristics and the gap score between their expectations and actual experiences of DIS at *Puskesmas* are presented in **Table 5**. Patients with a monthly income exceeding IDR 3,500,000 did not receive information on the quantity of medications dispensed, as they had expected. Conversely, patients with an income below IDR 1,000,000 received unexpected information on drug-food interactions, managing missed doses, and overdoses. They also received inquiries about co-medications and drug allergy history, which they had not anticipated. However, they did not receive information on drug-drug interactions (β=0.11; 95%CI: -0.43, -0.03) as expected (**Table 5**).

Patients between 31 and 50 years old did not receive information on managing accidental overdoses, as they had expected (**Table 5**). Patients over 50 years old unexpectedly received information on expected drug effects. However, they expected to receive information on side effects, storage, managing missed doses and overdoses, and inquiries about medication history, which did not align with the experiences they received when receiving DIS.

Patients who visited the *Puskesmas* twice in the last three months received information that they had not expected, including details on the expected effects of drugs, side effects, drug-drug interactions, overdose management, and questions about their comedications (β=-0.09; 95%CI: -0.40, -0.01) (**Table 5**). Patients who visited at least three times in the last three months also had the experience of receiving information that they had not expected, including details on potential side effects, storage guidelines, drug-food interactions, missed doses, and overdose management. Meanwhile, this group of patients perceived that they had not received information about drug-to-drug interactions (β=0.14; 95%CI: -0.54, -0.12) that met their expectations.

The group of participants with comorbidities had not received information about drug effects (β=0.10; 95%CI: 0.02, 0.36) by their expectations. Meanwhile, patients living alone or with one other person did not require information about drug dosage forms (β=-0.09; 95%CI: -0.55, -0.02) (**Table 5**).

Patients with more than 12 years of education felt they did not receive the expected level of information on side effects, storage procedures, and inquiries about medication history, co-medications, and drug allergies.

Patients' perspectives on pharmaceutical services at the *Puskesmas* are presented in **Table 6**. Over 90% of patients rated the staff as friendly, professional, and using clear communication.

Additionally, more than 85% appreciated the emphasis on important drug information and the calm environment. However, there is room for improvement, as less than 80% of patients felt the staff thoroughly ensured their understanding of the medication information and spent enough time communicating with them.

Table 6. Patient perceptions of pharmaceutical services at *Puskesmas*

Perception of pharmaceutical services	Very poor n (%)	Poor n (%)	Good n (%)	Excellent n (%)	Median (Q1, Q3)
Friendly	2 (0.3)	23 (3.7)	254 (40.8)	343 (55.1)	4 (3.4)
Professional	3 (0.5)	48 (7.7)	254 (40.8)	317 (51)	4 (3.4)
Use of simple language	5 (0.8)	39 (6.3)	247 (39.7)	331 (53.2)	4 (3.4)
Highlighting key information	9 (1.4)	78 (12.5)	237 (38.1)	298 (47.9)	3 (3.4)
Reassurance of understanding	18 (2.9)	126 (20.3)	220 (35.4)	258 (41.5)	3 (3.4)
Adequate communication time	35 (5.6)	90 (14.5)	225 (36.2)	272 (43.7)	3 (3.4)
Tranquil setting	11 (1.8)	75 (12.1)	301 (48.4)	235 (37.8)	3 (3.4)

Discussion

Pharmacists play a critical role in ensuring patients understand their medications by providing drug information [18]. This information empowers patients to participate in their treatment actively and reduces medication errors [19]. In Indonesia, pharmacists at *Puskesmas* are required to provide DIS; however, limitations like time constraints, high patient volumes, and staffing shortages often hinder these services. To address this gap, this study investigated the disconnect between what patients expect from *Puskesmas* pharmacists regarding drug information and what they experience. Additionally, the study explored how patients' sociodemographic characteristics influence their drug information needs. In this study, we used the DIS questionnaire, whose domains and items have been validated and adapted to the Indonesian context, aligning with the Pharmacy Service Standards in Community Health Centers as stipulated in the Indonesian Ministry of Health Regulation Number 74 of 2016.

This study observed a significant disparity between patients' expectations and experiences regarding the required drug information across all aspects. The gap applies to various aspects of medication, including quantity, effects, dosage forms, administration, side effects, storage, interactions (both with other drugs and food), managing missed doses, overdoses, and inquiries about medication history (past use, co-medications, allergies). The findings support existing research. A similar study has documented high patient expectations for detailed information, especially regarding side effects [5]. Additionally, a previous study also pointed to a consistent disconnect between what patients expect and what they experience when it comes to drug information, particularly concerning side effects, drug interactions, and disclosure of allergies [8].

Our study suggested that patients aged 31–50 years expressed a stronger desire for comprehensive drug information, particularly concerning the dosage and effects of the medications they receive. As individuals age, their susceptibility to developing illnesses increases, leading to a higher demand for medications. The growing number of medications prescribed can escalate the complexity of the patient's treatment regimen. DIS focusing on the dosage and expected effects of medications have the potential to enhance adherence and improve patients' quality of life [20]. Moreover, equipping patients with detailed medication information empowers them to participate in their treatment actively [20].

Our study found that patients with more than 12 years of education showed a stronger need for information on drug effects. This can be linked to factors like better cognitive skills, improved health literacy, and a greater understanding of how drug effects influence treatment decisions. Their enhanced information processing abilities allow them to weigh the risks and benefits of medications, leading to more informed healthcare choices [21,22].

Patients with multiple chronic illnesses have a greater need for comprehensive drug information to avoid treatment errors [19]. They need details on medication effects and potential interactions and want to discuss their medication history to ensure no duplication or negative interactions occur. They also value information on managing missed doses, overdoses, and proper storage. The complexity of their treatment plan increases the risk of forgetting doses or taking

medications incorrectly. Additionally, patients with multimorbidity require information on proper medication storage, as they recognize that each medication possesses distinct physicochemical characteristics and may require specific storage conditions to maintain drug stability. Specific storage conditions are essential to prevent drug degradation, which could compromise drug efficacy and lead to adverse reactions. Proper drug storage practices play a crucial role in minimizing medication errors [23]. Ultimately, a lack of understanding due to inadequate information can lead to medication misuse, reduced quality of life, and potentially even fatal outcomes [24].

The study revealed a trend where patients visiting *Puskesmas* pharmacies more frequently may be less interested in repetitive information. Regular visits, often for refilling medications, could lead to familiarity with details on drug effects, storage, interactions (both food and drug-to-drug), and overdose management. Similarly, patients over 50 may not prioritize information on storage, interactions, or inquiries about their medication history or allergies. This is probably because geriatric patients feel knowledgeable and understand the medications they use. This can be observed from their adherence to the prescribed treatment regimen, as evidenced by their repeated visits to the community health center to refill their prescriptions [25]. As a result, they might perceive certain drug information as unnecessary. This highlights the importance of tailoring drug information delivery to patient needs and frequency of visits.

Our analysis also revealed gender and income disparities in information preferences. Female patients had a greater interest in understanding the dosage form of their medications, possibly due to a more cautious approach to healthcare compared to males [26]. Patients with incomes below one million rupiah generally do not seek information on managing missed or double doses of medication. Additionally, they do not anticipate inquiries regarding their current and past medication usage or drug allergy history. Individuals with lower incomes tend to limit their health-related behaviors, including seeking information about their medication, as their focus is often directed more towards financial concerns than their health [27]. Consequently, information about their health condition may not be a top priority for them, which can impact their adherence to treatment [28].

Unemployed patients, according to the previous study, are more likely to self-medicate without consulting a doctor [29]. This might explain why they do not expect inquiries about their current medications. Interestingly, the study found the opposite trend for patients with larger families (at least three people). These patients desired more details on drug interactions, possibly due to the habit of keeping leftover medications at home for self-medication within the family unit. The variety and number of medications stored with a larger family may also increase. Therefore, for this group, understanding drug interactions becomes crucial to avoid potential side effects arising from accidentally combining medications [30].

The study revealed positive perceptions of *Puskesmas* pharmacy staff. Over 90% of patients rated the staff as friendly, professional, and using clear communication. This aligns with existing research highlighting positive patient experiences with pharmacist demeanor, explanations, and precise information delivery [31,32]. Additionally, more than 85% of respondents appreciated the emphasis on important drug information and the calm environment. However, there is room for improvement, as less than 80% of patients felt the staff thoroughly ensured their understanding of the medication information or spent enough time communicating with them. This suggests a need to focus on ensuring clear comprehension and providing sufficient time for patient interaction, similar to the previous study where timely service contributed to patient satisfaction [32]. It is important to note that the lack of dedicated counselling rooms in most Makassar *Puskesmas* limited the questionnaire's scope on this aspect.

Several strategies can be employed to enhance the quality of DIS at *Puskesmas*. First, ensuring that the number of pharmacy staff is sufficient to meet patient demand is crucial, as adequate staffing allows pharmacists to spend more time with each patient, thereby improving the quality of DIS. Second, regular training sessions focused on DIS and communication skills are essential for pharmacists, covering the latest clinical guidelines, effective communication techniques, and patient counseling strategies to ensure pharmacists are well-equipped to provide high-quality information. Third, drug information provided to patients should be tailored to their individual needs, considering their sociodemographic status and clinical condition. Personalized

counseling can significantly improve patient understanding, adherence, and satisfaction with their treatment regimen. Fourth, providing pharmacists with access to drug information resources such as electronic books, databases, and supportive software can enhance their ability to deliver accurate and up-to-date information. These tools can serve as valuable references during patient consultations. Fifth, introducing financial incentives for pharmacists who excel in providing high-quality DIS can motivate and reward excellence, leading to improved service quality and better patient outcomes. Sixth, implementing feedback mechanisms where patients can provide input on the DIS they receive can help identify areas for improvement. Regularly analyzing this feedback can drive continuous improvement in service quality. Finally, implementing quality assurance programs to regularly monitor and evaluate the DIS provided at *Puskesmas* can help maintain high standards of drug information delivery. By incorporating these strategies, *Puskesmas* can further elevate the quality of their DIS, ensuring that patients receive comprehensive, accurate, and personalized medication guidance, ultimately leading to improved health outcomes and patient satisfaction.

This study acknowledges several limitations. Firstly, cultural and language barriers between pharmacists and some patients, especially older adults, may have hindered clear communication of drug information. Secondly, the varied nature of illnesses and medications across patients could have introduced bias in assessing the information received. Patients with different conditions require specific drug information, and this variation might have influenced their perception of the comprehensiveness of the information provided. Thirdly, respondents may experience difficulties in recalling or accessing accurate information, resulting in errors in their responses to the questions. However, due to the relatively brief time interval between the provision of drug information and the administration of the questionnaire, such biases can potentially be minimized. Fourth, since we used non-random sampling, our sample may not fully represent the broader population, leading to potential limitations in the applicability of our results beyond the sampled group. Thus, while our findings provide valuable insights within the scope of our study, caution should be exercised when extrapolating these results to broader populations or contexts.

Conclusion

The study concluded that a notable disparity exists between patients' expectations and their experiences of the drug information service in *Puskesmas*. Furthermore, sociodemographic factors influencing patients' need for DIS encompassed age, sex, length of education, comorbidities, family size, average number of visits, monthly income, and occupational status. These findings underscore the necessity for enhanced DIS at *Puskesmas*, with tailored communication strategies to effectively address the diverse needs of patients based on their characteristics. Augmenting human resources through routine training regarding DIS in healthcare facilities, coupled with improvements in infrastructure, such as the provision of counseling rooms, could be beneficial.

Ethics approval

Before commencing the survey, participants were invited to read and sign an informed consent form, which was included on the first page of the questionnaire. This form outlined the study's objectives, data collection procedures, and confidentiality measures. Ethical approval for this study was obtained from the Faculty of Public Health, Universitas Hasanuddin, Makassar, Indonesia, under reference number 4637/UN4.14.1/TP.01.02/2023. The study followed the ethical principles established in the 'Declaration of Helsinki'.

Competing interests

The authors declare that there is no conflict of interest.

Underlying data

The Indonesian version of the questionnaire and detailed validation test results are available from https://figshare.com/articles/dataset/Supplementary_Materials_of_Questionnaire_Drug_Infromation_Services_docx/25895383.

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