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Sociodemographic Factors on Aspects of Knowledge, Belief, Attitude, and Practice of Antibiotic Use Among the Community in Bandar Lampung City, Indonesia

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Abstract

Background: *Antibiotic resistance (AMR) is a critical global health threat, often exacerbated by inappropriate self-medication. In Indonesia, infectious diseases remain a leading cause of mortality, yet public understanding of and practices regarding antibiotic use are often suboptimal.* ***Objective:*** *This study investigated the association between sociodemographic factors and knowledge, beliefs, attitudes, and practices (KAP) regarding antibiotic use in the community in Bandar Lampung, Indonesia.* ***Methods****: A community-based cross-sectional survey was conducted from March to April 2023 across 31 primary healthcare centers in 17 sub-districts. A total of 418 respondents were selected using a two-stage cluster sampling method. Data were collected using a validated questionnaire (Cronbach's alpha > 0.6) and analyzed using Chi-square and Fisher's exact tests (p<0.05).* ***Results:*** *The findings showed that 53.35% of respondents had inadequate knowledge, and 49.76% practiced self-medication. Although 94.50% held favorable attitudes toward rational use, a notable "attitude-practice gap" persisted. Statistical analysis found that sociodemographic factors, including age, education level, and health insurance, were not significantly associated with knowledge, beliefs, or attitudes (p>0.05), indicating that misconceptions were uniformly distributed across the community. However, antibiotic-use practices were significantly associated with gender (p=0.038) and Employment status (p=0.027). Furthermore, knowledge levels were significantly associated with self-medication practices (p=0.028), identifying inadequate health literacy as a primary driver of inappropriate drug acquisition.* ***Conclusion:*** *Although theoretical attitudes were positive, inadequate knowledge and easy access to medication fueled high rates of self-medication. Pharmacists must serve as clinical gatekeepers and implement community-wide educational interventions to correct misconceptions and promote rational antibiotic therapy.*

Keywords: *Anti-Bacterial Agents; Beliefs; Health Knowledge, Attitudes, Practice; Self Medication; Socioeconomic Factors*

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INTRODUCTION

Antibiotic therapy is a vital component of healthcare, particularly in developing countries. The World Health Organization (WHO) reports that infectious diseases remain the leading cause of death in the Southeast Asia region, including Indonesia [1]. A study found that antibiotics were still sold without a prescription or the supervision of a healthcare professional in many parts of the world. Data indicate that most antibiotics are obtained without a prescription [2–5]. Self-medication with antibiotics for infectious diseases poses a risk of irrational drug use, which can lead to harmful drug interactions. It also plays a major role in the emergence of antimicrobial resistance [4].

Sociodemographic factors, such as gender, insurance coverage, and level of knowledge, are known to influence antibiotic use [4,6–8]. Insufficient knowledge about antibiotics is linked to high rates of antibiotic use without a prescription. A study of medical students in Indonesia and Sudan found that although students were aware that using antibiotics without a prescription was inappropriate, they still engaged in this practice [9,10]. Inadequate knowledge of antibiotics, influence from relatives or neighbors, and experience with effective antibiotic treatment were key factors associated with the use of antibiotics without a prescription [11].

Findings from earlier studies indicated that sociodemographic factors significantly influenced antibiotic use patterns. Specifically, Aslam *et al*. reported that age, gender, and education levels determined antibiotic usage in Pakistan [1]. At the same time, Ramdini et al. observed that local knowledge and attitudes drove self-medication practices in rural Indonesia [10]. However, the escalating global threat of antimicrobial resistance created an urgent need to examine deeper systemic and behavioral drivers across different healthcare settings. Exploring these broader systemic factors, Klein et al. revealed that severe racial and socioeconomic disparities dictated inappropriate antibiotic prescribing rates in emergency departments [11]. Furthermore, Lansink et al. demonstrated that psycho-socio-organizational elements—most notably uncertainty management, perceived patient pressure, and time constraints—strongly influenced potentially inappropriate prescribing by physicians [12]. Beyond prescribers, Bianco et al. identified that pharmacists' specific knowledge and personal beliefs critically affected their dispensing practices, including the widespread issue of dispensing antibiotics without a prescription [13]. To urgently address these inappropriate practices, recent evidence highlighted the novel integration of community pharmacies into antimicrobial stewardship (AMS) programs. Lambert et al. showed that community pharmacist-led interventions successfully optimized antibiotic use and enhanced patient adherence [13,14]. Supporting this new paradigm, Federico et al. concluded that despite implementation barriers such as inadequate remuneration, the inherent accessibility of community pharmacy teams facilitated effective AMS interventions, demonstrating a critical and expanded role for pharmacists in combating resistance [15,16].

MATERIALS AND METHODS

Study Design and Setting

The study employed a quantitative, community-based, cross-sectional survey design to assess knowledge, beliefs, attitudes, and practices regarding antibiotic use. The research was conducted in Bandar Lampung City, Lampung Province, Indonesia, across 31 government-owned primary healthcare centers in 17 sub-districts. Data collection took place from March to April 2023. This study followed the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines to ensure rigorous reporting.

Participant Recruitment and Eligibility Criteria

The source population comprised adult residents of Bandar Lampung City who visited the selected healthcare centers during the study period. To be eligible, participants had to meet the following inclusion criteria, namely (1) aged ≥18 years; (2) had used antibiotics within the previous six months (prescribed or self-administered); (3) could identify at least one antibiotic used; and (4) provided written informed consent. Individuals were excluded if they had incomplete information or communication limitations, such as severe cognitive impairment or an inability to understand Bahasa Indonesia. This inclusion approach was consistent with established protocols for community-based antibiotic studies in Southeast Asia.

Sampling Technique and Sample Size

A two-stage cluster sampling method was used to select respondents. In the first stage, all 31 primary health centers served as clusters, and the number of respondents per center was determined proportionally to outpatient visit records. In the second stage, participants were recruited consecutively from daily registration lists until the required quota for each cluster was met. The minimum sample size was calculated using a single-population proportion formula, which required 384 participants; however, 418 respondents were enrolled.

Research Instrument

A structured questionnaire, developed and adapted from validated instruments used in similar KAP studies, served as the primary tool. It was divided into five sections, namely sociodemographics (10 items), practice (6 items), knowledge (12 items), beliefs (12 items), and attitudes (12 items). This multi-domain structure followed frameworks established in previous antimicrobial stewardship research. The instrument is detailed in Table 1.

Table 1. Domains and scoring of the study questionnaire

Domain	Purpose	Items (n)	Response Scale	Scoring Method
Sociodemographic characteristics	Describe participants' demographic and socioeconomic profile	10	Categorical	Descriptive analysis
Antibiotic use practices	Assess antibiotic acquisition and utilization behaviors	6	Multiple-choice / Dichotomous	Descriptive analysis
Knowledge	Assess knowledge regarding appropriate antibiotic use	12	Correct / Incorrect / Don't know	Correct = 1; Incorrect or Don't know = 0
Beliefs	Assess beliefs toward antibiotic use	12	Five-point Likert scale	Higher scores indicate more appropriate beliefs
Attitudes	Assess attitudes toward rational antibiotic use	12	Four-point frequency scale	Higher scores indicate more positive attitudes

Measurement and Scoring

In the knowledge domain, correct responses received a score of 1, while incorrect or "don't know" answers received a score of 0. Raw scores were converted to percentages. Subsequently, the scores were classified as poor (<56%), sufficient (56–75%), and good (76–100%), following established criteria in recent public health surveys [10]. Attitudes were similarly classified as favorable (≥70%) or unfavorable (<70%).

Validity and Reliability

The questionnaire underwent a content validity review by experts in pharmacy and public health. A pilot study with 30 non-respondents was conducted to assess face validity and reliability. Validity was confirmed using Pearson Product-Moment correlation ($p < 0.05$), and reliability was established with Cronbach's alpha > 0.6. Based on the pilot results, one unclear item was removed from the attitude domain.

Data Collection Procedure

Data were collected through face-to-face interviews conducted by trained project students in the waiting areas of healthcare centers. Respondents completed the questionnaires independently, with students available to clarify questions without influencing the answers. Completed forms were screened daily for completeness; those with missing data were excluded from the final analysis.

Statistical Analysis

Data were analyzed using statistical software. Categorical variables were summarized using frequencies and percentages to describe the distribution of respondents' sociodemographic characteristics and KAP outcomes. Bivariate analyses were conducted to examine the associations between sociodemographic characteristics and each KAP domain. The Pearson Chi-square test was used for variables meeting the test assumptions, whereas Fisher's exact test was applied when expected cell frequencies were less than five. All statistical tests were two-tailed, and statistical significance was established at a *p*-value of < 0.05.

Ethical Considerations

The study received ethical clearance from the Ethics Committee of Universitas Malahayati (No. 3270/EC/KEP-UNMAL/II/2023) and formal approval from the local government. All participants provided informed consent, and data confidentiality was strictly maintained throughout the study.

RESULTS AND DISCUSSION

Instrument Validity and Reliability

Before primary data collection, the questionnaire underwent validity and reliability testing with a pilot group of 30 respondents who were excluded from the final sample. The validity analysis showed p-values < 0.05 for all 35 items, confirming the instrument's accuracy in measuring the intended constructs. Internal consistency was established with a Cronbach's alpha exceeding 0.6, indicating that the items were reliable for assessing the community's knowledge, beliefs, attitudes, and practices (KAP). During this preliminary phase, one item in the attitude domain was identified as invalid and removed to ensure the robustness of the final instrument. The implementation of a pilot study with 30 respondents aligned with established methodologies in community-based antibiotic studies, such as those conducted in Nepal and Vietnam, which utilized similar pre-testing procedures to ensure cultural and linguistic appropriateness [3]. The validity testing was crucial to ensure that each item accurately represented the true findings among the target population, a standard requirement for quantitative research aiming for universal applicability. While some literature suggests a Cronbach's alpha of 0.7 as the threshold for high internal consistency, values above 0.6 are widely accepted in exploratory social and public health research.

For instance, a community-based study reported Cronbach's alpha values of 0.63 to 0.67 for its KAP domains, further supporting the reliability of the current instrument. Removing the invalid item from the attitude domain was a necessary refinement to eliminate redundancy and improve the tool's internal consistency, a practice consistent with previous research in which items were revised or excluded if they failed to meet validation criteria. These rigorous validation steps ensured that the finalized questionnaire was a stable and precise tool for investigating the determinants of antibiotic use in Bandar Lampung [4].

Following the development and validation of the questionnaire, the finalized instrument was used to collect data from the main study population. The sociodemographic profile of the 418 respondents is presented below to provide the demographic context for the subsequent analyses of knowledge, beliefs, attitudes, and practices (KAP) regarding antibiotic use (Table 2).

Table 2. Sociodemographic characteristics of participants (n=418)

Variable	n	%
Age (years)		
17–35	144	34.45
36–55	232	55.50
56–65	42	10.05
Gender		
Male	172	41.15
Female	246	58.85
Education level		
Elementary school	46	11.00
Secondary school	306	73.21
Undergraduate	66	15.79
Employment status		
Not employed	169	40.43
Employed	249	59.57
Marital status		
Married	**367**	**87.80**
Unmarried	37	8.85
Widowed	14	3.35
Health insurance		
Yes	383	91.63
No	35	8.37
Monthly expenditure (IDR)		
≤ 1,250,000	132	31.58
> 1,250,000	286	68.42

Sociodemographic Profile of Respondents

A total of 418 respondents participated in this study. By age, the largest group was respondents aged 36-55, with 232 (55.50%). By gender, the largest group was women, with 246 (58.85%). By education level, the largest group was secondary school graduates, with 306 (73.21%). By Employment status, the largest group was 249 (59.57%). In terms of marital status, most respondents were married, accounting for 367 individuals (87.80%). Regarding health insurance status, 383 respondents (91.63%) reported having insurance. Meanwhile, based on monthly expenditure, the majority of respondents fell into the > IDR 1,250,001 category, totaling 286 individuals (68.42%), as shown in Table 2.

The sociodemographic distribution in this study reflected a community profile that is partially consistent with previous antibiotic use research in Southeast Asia and other developing regions. The predominance of female respondents (58.85%) aligns with community-based surveys conducted in Nepal (54.1%) and Boyolali, Indonesia, but contrasts with the male-dominated findings reported in Vietnam (56.4%). This female majority may be attributed to the traditional role of women as the primary health decision-makers and caregivers for their families, a factor frequently observed in public health studies where women are more likely to interact with primary healthcare services [5,6].

Furthermore, while most participants in Bandar Lampung were secondary school graduates, studies in Vietnam and Kerala, India, reported significantly higher rates of university education (93.7% and 88.6%, respectively). The high health insurance coverage rate (91.63%) in this study mirrors the high enrollment in Vietnam (95.3%), a critical factor because insurance status often determines whether patients seek professional medical consultations or opt for self-medication. Unlike studies skewed toward young adults (18–25 years), this sample primarily captured a middle-aged population (36–55 years). These discrepancies in age and educational background underscore the importance of localized public health messaging that accounts for the region's specific sociocultural and demographic fabric to address antibiotic misuse effectively [4,7,8].

Distribution of Knowledge, Beliefs, Attitudes, and Practices

Table 3 summarizes respondents' knowledge, beliefs, attitudes, and practices regarding antibiotic use. The findings indicated that more than half of respondents (223; 53.35%) had inadequate knowledge, 153 (36.60%) had sufficient knowledge, and only 42 (10.05%) demonstrated a good level of knowledge. Regarding beliefs, 219 respondents (52.39%) showed sufficient confidence, 104 (24.88%) had good confidence, and 95 (22.73%) reported poor confidence. In contrast, attitudes toward the rational use of antibiotics were overwhelmingly positive, with 395 respondents (94.50%) exhibiting a favorable attitude, compared with only 23 (5.50%) with an unfavorable attitude. However, analysis of antibiotic-use practices revealed that 208 respondents (49.76%) had used antibiotics without a prescription, while 210 (50.24%) followed professional medical guidance (Table 3).

Table 3. Distribution of knowledge, belief, attitude, and practice regarding antibiotic use (n = 418)

Variable	n	%
Level of knowledge		
Poor (score ≤55)	223	53.35
Sufficient (score 56–74)	153	36.60
Good (score ≥75)	42	10.05
Level of belief		
Poor (score ≤55)	95	22.73
Sufficient (score 56–74)	219	52.39
Good (score ≥75)	104	24.88
Level of attitude		
Unfavorable (score <70)	23	5.50
Favorable (score ≥70)	395	94.50
Practice of antibiotic use		
Without prescription	208	49.76
With prescription	210	50.24

Note. Knowledge and belief scores were categorized as Poor (≤55), Sufficient (56–74), and Good (≥75). Attitude was categorized as Unfavorable (<70) and Favorable (≥70). Practice refers to self-reported antibiotic acquisition. All subcategory percentages sum to 100.00% within each variable.

The prevalence of inadequate knowledge (53.35%) in the community in Bandar Lampung is a critical finding, as insufficient understanding is a primary driver of antimicrobial resistance (AMR) [9]. This level of knowledge is comparable to findings in Boyolali, Indonesia, where nearly half of the population also fell into the moderate or low knowledge categories due to limited health education on the specific roles and risks of antibiotics. Similar knowledge gaps have been documented in other developing regions, such as Nepal and Bhutan, where respondents often failed to distinguish antibiotics from other medications, such as paracetamol, or incorrectly believed they were effective against viral infections [5,6].

A notable paradox was observed in the attitude-practice gap: while 94.50% of respondents held a favorable attitude toward rational use, nearly half (49.76%) still practiced self-medication. This high rate of non-prescription use is significantly higher than the 15% reported in Namibia. It aligns with concerning trends in Vietnam, where approximately 87% of the public reported purchasing antibiotics directly from pharmacies. This discrepancy suggests that while the community recognizes the "theory" of appropriate use, actual behavior is often influenced by factors such as convenience, easy access to over-the-counter antibiotics, and prior successful experiences with self-medication [5,7,10].

The high proportion of respondents with sufficient beliefs (52.39%) yet poor practice further underscores that knowledge and confidence alone are insufficient to ensure rational use. In Indonesia, the availability of antibiotics in community pharmacies, coupled with weak enforcement of prescription-only laws, remains a significant barrier. These findings highlight the urgent need for multifaceted public health interventions that go beyond simple awareness campaigns to address the practical and sociocultural determinants of self-medication in Bandar Lampung. [5,6]

Associations Between Sociodemographic Factors and Knowledge, Beliefs, and Attitudes

The statistical analysis showed that most sociodemographic characteristics—including age, education level, and health insurance status—were not significantly associated with respondents' knowledge, beliefs, or attitudes toward antibiotic therapy ($p>0.05$; Table 4, Supplementary Tables S1–S3). This lack of association indicated that misconceptions about antibiotic use were uniformly distributed across the community of Bandar Lampung, suggesting that higher formal education did not necessarily translate into superior health literacy regarding antimicrobial resistance. This uniformity implies that public health challenges, such as the incorrect belief that antibiotics are effective against viral infections or simple fevers, are deeply rooted sociocultural issues rather than demographic ones.

In contrast, the practice of using antibiotics without a prescription was significantly associated with gender ($p=0.038$) and Employment status ($p=0.027$) (Table 4, Supplementary Table S4).

The significance of gender likely reflected the traditional role of women as primary health decision-makers and caregivers, which increased their interactions with community pharmacies and their likelihood of engaging in self-medication based on prior experiences [11,12]. Furthermore, the association with Employment status suggested that working individuals might opt for self-medication due to time constraints in urban settings, seeking "quick fixes" to avoid absenteeism from work. These determinants underscored that behavioral practices were often driven more by practical convenience and social roles than by theoretical knowledge.

Table 4. The association between sociodemographic factors and knowledge, belief, attitude, and practice regarding antibiotic use

Sociodemographic Factors	Knowledge	Belief	Attitude	Practice
Age (years)	0.540[a]	0.957[a]	0.518[a]	0.957[a]
Gender	0.579[a]	0.792[a]	0.283[a]	0.038[a]*
Level of education	0.630[a]	0.351[a]	0.958[a]	0.194[a]
Employment status	0.466[a]	0.648[a]	0.315[a]	0.027[a]*
Marital status	0.823[a]	0.345[a]	1.000[b]	0.628[a]
Health insurance	0.582[a]	0.398[a]	0.954[b]	0.206[a]
Monthly expenditure (IDR)	0.127[a]	0.734[a]	0.734[a]	0.364[a]

Note. All values represent *p*-values indicating the statistical significance of associations. Detailed cross-tabulations and frequencies for each category are provided in Supplementary Tables S1–S4. IDR = Indonesian Rupiah.
[a] Calculated using the Pearson Chi-square test.
[b] Calculated using Fisher's exact test.
* Statistically significant at $p < .05$.

The study highlighted significant gaps in the core principles of rational antibiotic use. While attitudes were generally favorable (94.50%), a critical "attitude-practice gap" persisted, as nearly half of respondents (49.76%) continued to self-medicate. Misconceptions were prevalent, particularly the belief that antibiotics speed recovery from colds or are effective against viral illnesses such as influenza. Furthermore, a significant portion of the community believed that treatment could be discontinued as soon as symptoms improved, violating the clinical principle of completing the full course of therapy to ensure total bacterial eradication and prevent the emergence of resistant strains. These irrational practices, combined with easy access to antibiotics in pharmacies without a prescription, significantly contribute to the development of antimicrobial resistance (AMR) [9,10,11].

These findings underscored the indispensable role of the pharmacist as a clinician in the primary healthcare system. Because sociodemographic factors were limited predictors of antibiotic knowledge, pharmacists must implement broad, community-wide interventions. As the most accessible healthcare professionals, pharmacists were uniquely positioned to triage common respiratory complaints and correct the misconception that antibiotics are necessary for viral infections [12–14]. Implementing pharmacist-led educational strategies—such as advising on treatment duration, potential side effects, and the risks of AMR—proved essential to reducing the over-the-counter supply of antibiotics. Ultimately, strengthening the pharmacist's advisory role and ensuring strict adherence to prescription-only regulations are vital strategies for mitigating the spread of resistant pathogens within the community [15].

Association Between Knowledge, Beliefs, and Attitudes and Antibiotic Use Practices

The statistical analysis revealed a significant association between respondents' knowledge levels and the practice of using antibiotics without a prescription (p=0.028; Table 5). Specifically, a higher proportion of individuals with poor knowledge (58.65%) engaged in self-medication than those with good knowledge (6.73%). This finding suggests that a lack of basic health literacy regarding antimicrobial therapy was a primary driver of inappropriate use within the community. Previous literature has established that when the general public has limited understanding of drug roles, they are significantly more likely to obtain antibiotics through non-professional channels. The correlation observed here implies that interventions aimed at correcting misconceptions are vital for shifting behavioral patterns toward more rational drug use [16,17].

Common misconceptions identified in the broader context of this study further explain the poor knowledge scores. A significant segment of the population incorrectly believes that antibiotics are effective against viral infections, such as the common cold, cough, and influenza. These misunderstandings often lead individuals to use antibiotics as a "quick fix" for self-limiting illnesses that do not require antimicrobial intervention [8,15]. Such practices not only expose patients to unnecessary drug risks but also violate the core clinical principle of targeted therapy, thereby contributing to the selection of resistant bacterial strains within the community [9,11,18].

Table 5. Association between aspects of knowledge, belief, and attitude towards the practice of antibiotic use

Aspect	Antibiotic Use without Prescription		Total	*p-value*
	Yes	No		
Knowledge				
Poor	122 (58,65%)	101 (48,09%)	223 (53,35%)	0,028*
Sufficient	72 (34,61%)	81 (38,57%)	153 (36,60%)	
Good	14 (6,73%)	28 (13,33%)	42 (10,05%)	
Belief				
Poor	45 (21,63%)	50 (23,81%)	95 (22,73%	0,816
Sufficient	112 (53,85%)	107 (50,95%)	219 (52, 39%)	
Good	51 (24,52%)	53 (25,24%)	104 (24,88%)	
Attitude				
Unfavorable	9 (4,32%)	14 (6,67%)	23 (5,50%)	0,294
Favorable	199 (95,67%)	196 (93,33%)	395 (94,50)	

Note. The chi-square test was used, with 16,7% of cells having an expected count less than 5. * Statistically significant at $p < .05$.

In contrast to the knowledge domain, a notable "attitude-practice gap" was observed, as favorable attitudes were not significantly associated with actual behavior (p=0.294; Table 4). Although 94.50% of respondents held a positive view of the theory of rational antibiotic use, nearly half of the sample continued

to practice self-medication [9,12,19]. This discrepancy suggests that behavioral choices were often dictated by external factors—such as easy access to over-the-counter antibiotics in community pharmacies and the practical convenience of self-treatment—rather than by theoretical beliefs or psychological confidence (p=0.816 for beliefs). This paradox aligns with international findings in which high public awareness of antimicrobial resistance (AMR) did not necessarily translate into the cessation of risky self-medication practices when antibiotics remained easily available. Furthermore, the study highlighted critical issues regarding treatment adherence, particularly the belief that antibiotics could be discontinued as soon as symptoms improved. Clinical principles dictate that a full course of therapy must be completed to ensure total bacterial eradication [4,19,20]. Failure to do so allows subpopulations of partially resistant bacteria to survive and multiply, a major driver of AMR. The tendency for community members to store "leftover" antibiotics for future emergencies further compounds this issue, as it facilitates subtherapeutic dosing and irrational self-treatment [13,15].

These findings underscore the indispensable role of the pharmacist as a clinical and primary health educator. Because knowledge was the only psychological domain significantly linked to practice, pharmacists are uniquely positioned to bridge literacy gaps at the point of care [21]. As the most accessible healthcare professionals, pharmacists can provide essential triage for common symptoms and correct the misconception that antibiotics are necessary for viral infections. Implementing pharmacist-led educational strategies such as providing oral and written advice on the risks of resistance and the importance of adherence is vital to influencing consumer behavior [22]. Ultimately, strengthening the pharmacist's advisory role and ensuring strict enforcement of prescription-only regulations are essential strategies for promoting rational antibiotic use and mitigating the spread of resistant pathogens within the community [23].

Literature identified multi-component educational interventions as the most effective strategies for improving antibiotic literacy. Effective methods combined standardized oral counseling with written materials, such as indication-specific tools that detailed typical infection duration and self-care advice [11,24,25]. Research demonstrated that face-to-face counseling, specifically focusing on adherence, the risks of skipping doses, and the consequences of AMR, significantly improved treatment outcomes and patient satisfaction. Furthermore, implementing audit-and-feedback designs in community pharmacies proved useful for correcting dispensing practices and enhancing the quality of clinical advice provided to the public [18,24,25]. Click or tap here to enter text.

Easy access to antibiotics was identified as a dominant driver of self-medication in the community. Despite favorable attitudes in theory, nearly half of respondents engaged in self-treatment because antibiotics remained readily available without a prescription in many pharmacies [11–13]. This high accessibility often led consumers to prioritize convenience and cost savings over professional medical consultation, viewing antibiotics as a "quick fix" for minor ailments such as the common cold or fever. Literature confirmed that the unrestricted sale of antimicrobials, combined with prior successful experiences with self-medication, facilitated the normalization of irrational drug use. Ultimately, the study highlighted that without strict enforcement of prescription-only laws, even high levels of public awareness may fail to prevent the continued spread of resistant bacterial strains within the community [14,17].

CONCLUSION AND SUGGESTION

This study concluded that while the community in Bandar Lampung City generally maintained a favorable attitude toward rational antibiotic use, there remained a concerning prevalence of inadequate knowledge and a high rate of self-medication. The investigation into sociodemographic factors revealed a unique trend: most demographic variables, such as age, education level, and health insurance status, were not significantly associated with respondents' knowledge, beliefs, or attitudes. This indicated that misconceptions regarding antibiotic therapy were uniformly distributed across the population, regardless of formal educational background. However, gender and Employment status were identified as key determinants that significantly influenced actual antibiotic-use practices, reflecting the influence of social roles and time constraints on health-seeking behavior. Furthermore, a significant correlation was established between knowledge levels and self-medication practices, confirming that insufficient health literacy is a primary driver of antibiotic use without a prescription.

Based on these findings, it is strongly recommended that local health authorities and pharmacists implement multifaceted educational interventions that are not limited to specific demographic groups and are accessible to the broader community. Clinical pharmacists should prioritize face-to-face counseling to correct misconceptions, particularly regarding the efficacy of antibiotics for viral infections, and emphasize the critical importance of completing a full course of therapy. Moreover, stricter enforcement of prescription-only

regulations in community pharmacies is essential to bridge the observed "attitude-practice gap" and reduce unrestricted access to antimicrobials. Future research should use multivariate statistical modeling to explore the independent effects of sociodemographic factors further and expand the study's scope to include rural populations or healthcare students, providing a more comprehensive national profile of antibiotic use in Indonesia.

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CONFLICT OF INTEREST
The authors declare that they have no conflicts of interest.

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Supplementary (S)

Table S1. Association Between Sociodemographic Factors and Knowledge Regarding Antibiotic Use

	Knowledge			
Sociodemographic Factors	**Poor (n)**	**Sufficient (n)**	**Good (n)**	**Total**
Age (years)				
17–35	83	50	11	144
36–55	121	86	25	232
56–65	19	17	6	42
Gender				
Male	97	59	16	172
Female	126	94	26	246
Level of education				
Nine years of formal education	89	52	15	156
Senior high school	97	77	22	196
Undergraduate	37	24	5	66
Employment status				
Not employed	84	67	18	169
Employed	139	86	24	249
Marital status				
Married	196	133	38	367
Unmarried	27	20	4	51
Health insurance				
Yes	202	141	40	383
No	21	12	2	35
Monthly expenditure (IDR)				
≤ 1,250,000	78	39	15	132
> 1,250,000	145	114	27	286

Note. Nine years of formal education includes elementary and junior high school. “Single” includes unmarried and widow/widower. IDR = Indonesian Rupiah.

Table S2. Association between sociodemographic factors and respondents' beliefs regarding antibiotic use

Sociodemographic Factors	**Belief**			**Total**
	Poor	**Sufficient**	**Good**	
Age (years)				
17–35	32	76	36	144
36–55	55	121	56	232
56–65	8	22	12	42
Gender				
Male	39	93	40	172
Female	56	126	64	246
Level of education				
Nine years of formal education	38	82	36	156
Senior high school	41	109	46	196
Undergraduate	16	28	22	66
Employment status				
Not employed	38	85	46	169
Employed	57	134	58	249
Marital status				
Married	82	197	88	367
Unmarried	13	22	16	51

Sociodemographic Factors	Belief			Total
	Poor	Sufficient	Good	
Health insurance				
Yes	88	197	98	383
No	7	22	6	35
Monthly expenditure (IDR)				
≤ 1,250,000	33	68	31	132
> 1,250,000	62	151	73	286

Table S3. Association between sociodemographic factors and respondents' attitudes regarding antibiotic use

Sociodemographic Factors	Attitude		Total
	Unfavorable	Favorable	
Age (years)			
17–35	7	137	144
36–55	15	217	232
56–65	1	41	42
Gender			
Male	7	165	172
Female	16	230	246
Level of education			
Nine years of formal education	8	148	156
Senior high school	11	185	196
Undergraduate	4	62	66
Employment status			
Not employed	7	162	169
Employed	16	233	249
Marital status			
Married	21	346	367
Unmarried	2	49	51
Health insurance			
Yes	21	362	383
No	2	33	35
Monthly expenditure (IDR)			
≤ 1,250,000	8	124	132
> 1,250,000	15	271	286

Note. The chi-square test was used, with 16,7% of cells having an expected count less than 5. The chi-square test was used, with 0.0% of cells having an expected count less than 5.5-6Fisher's exact test was used.

Table S4. Association between sociodemographic factors and respondents' practice regarding antibiotic use

Sociodemographic Factors	Antibiotic Use without Prescription		Total	*p-value*
	Yes	No		
Age (years)				
17–35	73	71	144	0,957
36–55	114	118	232	
56–65	21	21	42	
Gender				
Male	96	76	172	0,038*
Female	112	134	246	
Level of education				
Nine years of formal education	86	70	156	0,194
Senior high school	89	107	196	
Undergraduate	33	33	66	
Employment status				

Sociodemographic Factors	Antibiotic Use without Prescription		Total	*p-value*
	Yes	No		
Not employed	73	96	169	0,027*
Employed	135	114	249	
Marital status				
Married	181	186	367	0,628
Unmarried	27	24	51	
Health insurance				
Yes	187	196	383	0,206
No	21	14	35	
Monthly expenditure (IDR)				
≤ 1,250,000	70	62	132	0,364
> 1,250,000	138	148	286	

Note. The chi-square test was used, with 16,7% of cells having an expected count less than 5; *$p < 0.05$ indicates a statistically significant association based on the Chi-square test.