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Knowledge Level of Outpatients Regarding the Use of the Antibiotic Amoxicillin at Puskesmas Bojongloa

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Abstract. *The improper use of antibiotics can lead to bacterial resistance, resulting in therapy failure. This study aimed to determine the level of knowledge of outpatients regarding the use of the antibiotic amoxicillin at Puskesmas Bojongloa. This study used a quantitative descriptive method with an accidental sampling technique. The sample size was 91 respondents. Data were collected using a closed-ended questionnaire consisting of 10 questions regarding the use of the antibiotic amoxicillin. Data were analyzed descriptively in the form of percentages and categorized as good, fair, or poor. The results showed that the majority of respondents' knowledge levels fell into the poor category (35 respondents; 38.5%), followed by the fair category (31 respondents; 34.0%), and the good category (25 respondents; 27.5%). This study concludes that the level of knowledge of outpatients regarding the use of the antibiotic amoxicillin remains relatively poor, indicating a need for increased education on the appropriate use of antibiotics.*

Keywords: *Resistance; Amoxicillin; Antibiotic Use; Outpatients*

1. Introduction

Infectious disease remains one of the most important public health problems, particularly in developing countries. Antimicrobial agents — comprising antibacterials or antibiotics, antifungals, antivirals, and antiprotozoals — are among the primary therapies used to treat such conditions (1). Penicillin-class antibiotics, such as amoxicillin, were among the first antibiotics developed. This drug is derived from microorganisms and acts by inhibiting bacterial formation and growth, thereby contributing to damage of the bacterial cell wall. Amoxicillin is widely selected because it is inexpensive and readily available, making it one of the most frequently used penicillin-class antibiotics (1). Antibiotics are drugs that act by killing bacteria or inhibiting their growth. Antibiotics act on different bacteria in different ways, but are generally ineffective against viral infections. These antimicrobial substances may originate from bacteria and other eukaryotic organisms, including plants; they protect the body and inhibit or halt the growth of other bacteria (2). Antibiotics are commonly prescribed to patients; however, they are often used inappropriately, resulting in bacterial resistance to antibiotics (3). Antibiotic resistance is defined by the World Health Organization (WHO) as the condition in which bacteria become resistant to antibiotics that are otherwise effective in curing the infections they cause (4). Public unawareness regarding the correct use of antibiotics is one factor that can lead to antibiotic resistance. The effects of irrational antibiotic use can worsen the incidence of bacterial resistance. Because they feel they have already recovered, patients often do not complete the dosage prescribed by the physician, whereas appropriate and judicious antibiotic use reduces the level of resistance. Public

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understanding of antibiotic use is important for successful therapy and resistance prevention: when used according to the prescribed regimen, antibiotics improve patients' health outcomes, but when used without following the regimen, they become less effective (5).

According to the WHO and the Global Research on Antimicrobial Resistance (GRAM) 2025 report, antimicrobial resistance (AMR) is one of the greatest threats to global health. Approximately 1.14 million deaths were directly attributable to antibiotic resistance, and antibiotic-resistant bacterial infections were estimated to have caused 4.71 million deaths in 2021. Without effective control measures, approximately 39 million deaths due to AMR are projected between 2025 and 2050. In Indonesia alone, an estimated 36,500 deaths were directly attributable to AMR and approximately 147,000 deaths were AMR-associated in 2021; without effective control, AMR-related deaths in Indonesia could reach 182,000 cases by 2030 (6). The high rate of antibiotic resistance cannot be separated from irrational antibiotic use within the community. A study conducted in Malalayang District, Manado City, found that 380 respondents had used antibiotics without a physician's prescription; the most frequently purchased antibiotic, amoxicillin (41.05%), was used to treat mild symptoms such as fever and cough without a clear medical diagnosis, indicating that antibiotic use within the community remains relatively high (7).

Community knowledge about antibiotics is therefore essential for preventing resistance and ensuring treatment success. Several factors influence an individual's level of knowledge, such as occupation, education, and access to information services; the dissemination of information also affects a person's knowledge (8). Accurate and easily accessible information can improve public understanding of rational antibiotic use, whereas misinformation — such as the belief that antibiotics can treat all illnesses including viral infections (colds and flu), that antibiotics may be discontinued once symptoms improve, or that antibiotics may be used without a prescription and shared with others — can lead to inappropriate use and increase the risk of resistance (9). Educational activities are therefore needed to raise public awareness of antibiotic use (8). As a primary healthcare facility, the Puskesmas (community health center) plays an important role in educating the public on the appropriate use of amoxicillin. Research is therefore needed to determine the level of knowledge of outpatients regarding the use of the antibiotic amoxicillin at Puskesmas Bojongloa, to serve as a basis for planning health education programs.

This study is also relevant to the achievement of Sustainable Development Goal 3 (SDG 3: Good Health and Well-Being), particularly through efforts to prevent antimicrobial resistance and promote the rational use of antibiotics. Improving patients' knowledge of appropriate amoxicillin use, including adherence to prescribed doses and duration, avoidance of self-medication without proper medical indication, and awareness of antibiotic resistance, is an important component of antimicrobial stewardship at the primary healthcare level. By identifying gaps in patient knowledge, this study can support the development of targeted health education strategies at Puskesmas Bojongloa, thereby contributing to safer antibiotic use, more effective treatment, and the broader goal of reducing preventable health risks associated with antimicrobial resistance.

2. Methods

2.1. Type of Research

This study employed a quantitative descriptive design — a research method aimed at describing a phenomenon or condition using numerical data (10) — to determine the level of knowledge of outpatients regarding the use of the antibiotic amoxicillin at Puskesmas Bojongloa. Data were collected by having patients complete a questionnaire. The research instrument consisted of a 10-item questionnaire developed to assess outpatients' knowledge regarding the appropriate use of amoxicillin. The questionnaire items were constructed based on the study objectives, relevant literature on rational antibiotic use, and commonly emphasized aspects of patient knowledge, including indication, dosage, frequency of administration, duration of therapy, adherence to the prescribed regimen, antibiotic resistance, self-medication, sharing antibiotics with others, and appropriate storage or reuse of leftover antibiotics. Before being used in the main study, the questionnaire underwent validity and reliability testing in 30 outpatients with characteristics similar to those of the target population. These participants were adult outpatients who had previously used or received amoxicillin and were able to understand and complete the questionnaire. The pilot participants were recruited from a comparable primary healthcare setting and were not included among the final 91 respondents in the main study, thereby ensuring that the validity and reliability testing sample was independent from the study sample. Item validity was assessed by examining the correlation between each questionnaire item and the total questionnaire score. Items were considered valid when the calculated correlation coefficient exceeded the critical correlation value at the predetermined significance level. All 10 questionnaire items met the validity criteria and were therefore retained for the main study.

The internal consistency of the questionnaire was evaluated using Cronbach's alpha. The obtained Cronbach's alpha coefficient indicated an acceptable level of internal consistency for the 10-item instrument. Following completion of the validity and reliability testing, the finalized questionnaire was administered to the 91 outpatients included in the main study. Each correct answer was assigned a score of 1 and each incorrect answer a score of 0, resulting in a possible total score ranging from 0 to 10.

2.2. Location and Time of Research

This study was conducted at Puskesmas Bojongloa. A preparatory period in February was used to determine the number of visiting patients as a basis for sample size determination, while data collection was carried out in March 2026.

2.3. Population and Sample

The population is the entirety of subjects or objects with certain characteristics that constitute the target for generalization of the research results (11). The population of this study comprised all outpatients who visited Puskesmas Bojongloa during February–March 2026, totaling 1,374 visits; of this number, 360 patients were under 18 years of age. Thus, the population meeting the inclusion criteria for this study totaled 1,014 patients.

The sample is the portion of the population that is actually studied and is expected to represent the overall characteristics of the population (11). The sample of this study consisted of a portion of outpatients at Puskesmas Bojongloa who met the inclusion criteria. The sample size was determined using the Slovin formula with a margin of error (e) of 0.1 (12).

Slovin formula: $n = N / [1 + N(e)^2]$
Where: n = sample size; N = population size; e = margin of error
$n = 1{,}014 / [1 + 1{,}014(0.1)^2] = 1{,}014 / 11.14 = 91.02 \approx 91$
Based on this calculation using the Slovin formula, a sample size of 91 respondents was obtained.

Inclusion criteria:

- All outpatients at Puskesmas Bojongloa.
- Aged ≥ 18 years.
- Willing to participate as a respondent.
- Able to communicate adequately and without hearing impairment.
- Present in person (not represented by a family member).

Exclusion criteria:

- Outpatients aged under 18 years.
- Patients whose health condition prevented them from completing the questionnaire (e.g., an emergency condition).
- Patients with a mental condition impeding comprehension of the questionnaire items.
- Patients who declined to participate in the study.
- Patients who completed the questionnaire incompletely.

Sampling technique:

The sampling technique used in this study was accidental sampling, i.e., a sampling technique carried out directly and without prior planning (13). Samples were drawn from patients who visited Puskesmas Bojongloa during the study period and met the inclusion criteria (the requirements or characteristics that research subjects must fulfil to be included as a sample), such that these patients could be enrolled as study respondents.

2.4. Data Type and Source

- Data type: This study comprised quantitative and qualitative data. Quantitative data were obtained from questionnaire responses regarding the level of knowledge of amoxicillin use, while qualitative data were obtained from respondent characteristics, including the age and sex of the outpatients at Puskesmas Bojongloa.
- Data source: This study used two types of data, namely primary and secondary. Primary data were obtained directly from respondents through questionnaires completed by outpatients at Puskesmas Bojongloa, while secondary data were obtained from records of the number of outpatients at Puskesmas Bojongloa in February 2026.

2.5. Data Collection Technique

Data collection in this study was carried out as follows:

- Patient identification: The researcher identified outpatients at Puskesmas Bojongloa who met the inclusion criteria to be enrolled as study respondents.
- Requesting permission: Informing respondents of the purpose of the questionnaire before they began answering.
- Questionnaire distribution: Questionnaires were distributed to respondents who met the study requirements, accompanied by an explanation of how to complete them.
- Data validation: The researcher rechecked completed questionnaires to ensure the data were complete and clear before proceeding to data processing.

Research instrument:

The instrument used in this study was a questionnaire assessing patients' level of knowledge regarding the use of the antibiotic amoxicillin. It was a closed-ended questionnaire with true/false response options, consisting of ten questions, with a score of 1 for each correct answer and 0 for each incorrect answer. The results were used to determine each patient's knowledge category.

2.6. Data Analysis Technique

Quantitative data were analyzed by scoring each respondent's questionnaire responses. Each correct answer was assigned a score of 1, while each incorrect answer was assigned a score of 0. Because the questionnaire consisted of 10 items, the total possible score for each respondent ranged from 0 to 10. The total score was then converted into a percentage using the following formula:

$$\textbf{Knowledge score (\%)} = (\textbf{Total correct answers} / 10) \times 100$$

The respondents' knowledge levels were subsequently classified into three mutually exclusive categories to avoid overlap between score intervals. The classification was defined as follows:

Table 1. Knowledge Level Classification

Category	Percentage	Equivalent Score from 10 Items
Good	76–100%	8–10 correct answers
Fair	56–75%	6–7 correct answers
Poor	0–55%	0–5 correct answers

Thus, respondents who answered 8–10 items correctly were classified as having good knowledge, respondents with 6–7 correct answers were classified as having fair knowledge, and respondents with 0–5 correct answers were classified as having poor knowledge. This scoring procedure was applied consistently to all 91 respondents. The results were then summarized using frequencies and percentages to describe the distribution of respondents according to their level of knowledge regarding the appropriate use of amoxicillin.

2.7. Qualitative Descriptive Analysis

The questionnaire findings were also interpreted descriptively to identify areas in which respondents demonstrated stronger or weaker knowledge regarding amoxicillin use. Item-level responses were examined to determine which aspects of antibiotic use were most frequently understood or misunderstood by respondents. These findings were used to support the descriptive interpretation of the overall knowledge levels among outpatients at Puskesmas Bojongloa.

2.8. Operational Definition of Variables

Table 2. Operational Definition of Variables

Variable	Operational Definition	Indicator	Measurement Instument	Result	Scale
Patients' knowledge level regarding amoxicillin use	The level of outpatients' understanding of the use of the antibiotic amoxicillin, including its function, instructions for use, and the effects of inappropriate use	Questionnaire	Respondents completed a survey of ten questions with true/false answers	Good: ≥75% Fair: 56–75% Poor: ≤56%	Ordinal
Age	Respondent's age calculated from date of birth to the time of the study	Questionnaire	Respondents selected an age category on the identity sheet	18 years; 19–29 years; 30–39 years; 40–49 years; and ≥55 years	Ordinal
Sex	Respondent's sex in the study	Questionnaire	Respondents selected their sex on the identity sheet	Male Female	Nominal

2.9. Research Ethics

In conducting this study, the researcher observed the following research ethics:

- Respondent consent: Before completing the questionnaire, the researcher explained the purpose and procedure of the study to respondents. Those willing to participate were asked to provide voluntary consent.
- Anonymity: To protect respondents' identities, the researcher used only their initials (e.g., Mrs. C and Mr. A) on the questionnaire sheet and did not record their names.
- Data confidentiality: Data collected from respondents were used solely for research purposes.
- Voluntariness: This study was conducted voluntarily and without coercion

3. Results and Discussion

This study involved 91 outpatients at Puskesmas Bojongloa. Data were collected on respondent characteristics based on age and sex, as well as their level of knowledge regarding the use of the antibiotic amoxicillin. To facilitate interpretation, the results are presented as frequency distribution and percentage tables.

3.1. Validity and Reliability Test

Table 3. Validity Test

Question	r-calculated	r-table	Sig. (P)	Remarks
P1	0.499	0.361	0.005	Valid
P2	0.489	0.361	0.006	Valid
P3	0.515	0.361	0.004	Valid
P4	0.482	0.361	0.007	Valid
P5	0.711	0.361	0.000	Valid
P6	0.674	0.361	0.000	Valid
P7	0.502	0.361	0.005	Valid
P8	0.525	0.361	0.003	Valid
P9	0.607	0.361	0.000	Valid
P10	0.668	0.361	0.000	Valid

Table 4. Reliability Test

Variable	Cronbach's Alpha	Number of Items	Remarks
All items (P1–P10)	0.765	10	Reliable

The validity test results in Table 3 show that all questions (P1–P10) had an r-calculated value greater than the r-table value, with a significance value (Sig. P) below 0.05 (14). The r-calculated values ranged from 0.482 to 0.711, all exceeding the r-table value. Thus, all questionnaire items were valid and suitable for use as a research instrument.

The reliability test results in Table 4 yielded a Cronbach's Alpha value of 0.765 for the 10-item instrument. A Cronbach's Alpha value greater than 0.70 is considered acceptable (14); therefore, all items in the research instrument were reliable and demonstrated a good level of internal consistency, confirming that the questionnaire was suitable for use as a data collection instrument.

3.2. Respondent Characteristics

Respondent characteristics in this study included age and sex, and the results showed differences in the number of respondents across groups based on these characteristics.

Table 5. Distribution of Respondents by Age

Age Group	n	%
8 years	3	3.30%
9–29 years	39	42.86%
0–39 years	20	21.98%
40–49 years	12	13.17%
≥50 years	17	18.69%
Total	91	100%

Table 5 shows that, of the total 91 respondents, the majority were in the 19–29-year age group (39; 42.86%), followed by the 30–39-year age group (20; 21.98%) and the ≥50-year age

group (17; 18.69%). The 40–49-year age group comprised 12 respondents (13.17%), while the 18-year age group had the fewest respondents.

Table 6. Distribution of Respondents by Sex

No	Sex	n	%
1	Female	57	62.64%
2	Male	34	37.36%
	Total	91	100%

Table 6 and Figure 1 show that respondents comprised both male and female participants. The highest number of respondents was female (57; 62.64%), while male respondents numbered 34 (37.36%).

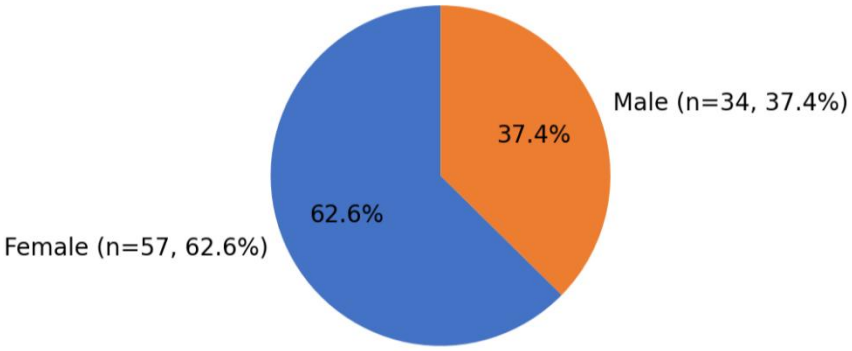

Figure 1. Pie chart of respondent distribution by sex

3.3. Distribution of Correct Answers

Table 7. Distribution of Respondents' Correct Answers Regarding the Use of the Antibiotic Amoxicillin

No	Questionnaire Item	Correct (n)	Incorrect (n)	Percentage (%)	Category
1	Is amoxicillin used to treat infections caused by bacteria?	75	16	82.4%	Good
2	Can amoxicillin be used to treat all types of illness?	45	46	49.5%	Poor
3	Can amoxicillin be used to treat colds and coughs?	49	42	53.8%	Poor
4	Must amoxicillin be taken until completed, as prescribed by a physician?	71	20	78.0%	Good
5	If you feel recovered before the medication is finished, may amoxicillin be discontinued?	45	46	49.5%	Poor
6	Are you aware of antibiotic resistance (bacterial resistance to antibiotics)?	41	50	45.1%	Poor
7	May amoxicillin be used without a physician's prescription?	59	32	64.8%	Fair

8	May amoxicillin be shared with others who have similar complaints?	59	32	64.8%	Fair
9	Are you aware that amoxicillin must be taken every 8 hours?	55	36	60.4%	Fair
10	Do you store antibiotics and reuse them when symptoms recur?	60	31	65.9%	Fair

Based on the study results, the discussion focuses on items 4, 5, 6, 7, 8, 9, and 10, as these questions relate directly to the rational use of the antibiotic amoxicillin and the prevention of antibiotic resistance. For item 4, the percentage of correct answers was 78%, indicating that most respondents understood the importance of taking antibiotics as prescribed by a physician; completing the prescribed course is essential for preventing antibiotic resistance. The percentage of correct answers for item 5 was 49%, indicating that many respondents did not yet understand that antibiotics should not be discontinued prematurely even after symptoms have resolved. Discontinuing antibiotics prematurely can cause the infection to recur. Item 6 had the lowest percentage of correct answers, at 45%, indicating that respondents did not adequately understand antibiotic resistance a condition in which bacteria become resistant to antibiotics, making treatment more difficult (15). The percentage of correct answers for item 7 was 64.8%, indicating that most respondents were aware that antibiotics should be used only with a physician's prescription and that improper use can lead to medication errors.

A total of 64.8% of respondents answered item 8 correctly, indicating that most respondents understood that antibiotics should not be given to others even if they have similar complaints. The percentage of correct answers for item 9 was 60%, indicating that some respondents were aware of the correct antibiotic dosing schedule, while others had not yet understood the proper medication schedule. For item 10, the percentage of correct answers was 65.9%, indicating that most respondents understood that antibiotics should not be stored for reuse without a physician's prescription.

3.4 Knowledge Level Category

Table 8. Category of Respondents' Knowledge Level Regarding the Use of the Antibiotic Amoxicillin

Category	n	%
Good	25	27.5%
Fair	31	34.0%
Poor	35	38.5%
Total	91	100%

Of the total 91 respondents, the majority had a poor level of knowledge regarding the use of the antibiotic amoxicillin (35; 38.5%), followed by a fair level of knowledge (31; 34.0%) and a good level of knowledge (25; 27.5%). These results indicate that the majority of respondents did not yet properly understand the use of the antibiotic amoxicillin. Therefore, increased public education on the appropriate and rational use of antibiotics is needed. The present study identified the lowest levels of knowledge in two particularly important domains: understanding of antibiotic resistance and awareness regarding premature

discontinuation of amoxicillin. Only 45% of respondents correctly answered the item related to antibiotic resistance, indicating a substantial knowledge gap regarding the consequences of inappropriate antibiotic use. This finding is lower than that reported in a study among Indonesian respondents, where a larger proportion of participants demonstrated awareness of antibiotic resistance, although misconceptions regarding antibiotic use remained common. A national Indonesian study also found that approximately 29% of respondents admitted stopping antibiotics once they felt better, while around 75% reported completing the prescribed course. Similar knowledge gaps have been reported internationally. A community-based study in Ethiopia found that only 36.6% of respondents were aware of the term "antibiotic resistance," despite 58.2% being aware of antibiotic-resistant bacteria. These comparisons suggest that awareness of antimicrobial resistance remains uneven across different populations and that knowledge of the term itself does not necessarily indicate an adequate understanding of how individual antibiotic-use behavior contributes to resistance.

The finding for item 5 is also important, as only 49% of respondents correctly understood the issue of discontinuing amoxicillin before the prescribed treatment period had been completed. Previous studies have similarly reported misconceptions concerning the duration of antibiotic treatment. A WHO multi-country survey found that approximately one-third of respondents believed antibiotics could be stopped once they felt better, while country-specific results showed substantial variation in this misconception. In a community study conducted in Ethiopia, 36.6% of respondents reported discontinuing antibiotics when they felt better. Likewise, a study in South Jordan showed that although more than half of participants reported completing antibiotics according to physicians' instructions, inappropriate antibiotic-use behaviors remained common. These findings indicate that premature discontinuation remains a recurrent misconception in different healthcare settings and should therefore receive specific attention in patient education. However, the interpretation of antibiotic-course completion should be presented carefully. Current evidence increasingly supports shorter antibiotic courses for selected infections when these regimens are clinically validated and prescribed by healthcare professionals. Therefore, patients should not be encouraged to extend antibiotic therapy unnecessarily or independently decide when to stop treatment. Instead, the central educational message should be that amoxicillin must be taken exactly according to the dose, frequency, and duration prescribed by the physician or other authorized prescriber, and that patients should not discontinue or prolong therapy based solely on symptom improvement without professional advice.

The relatively low scores for antibiotic-resistance knowledge and appropriate discontinuation behavior have practical implications for Puskesmas Bojongloa. Patient education should move beyond general information about antibiotics and focus specifically on misconceptions identified in this study. Educational interventions should explain in simple language that antibiotic resistance occurs in bacteria rather than in the patient's body, that antibiotics are ineffective against most viral infections, that antibiotics should not be obtained or reused without appropriate medical assessment, and that prescribed dosing instructions should be followed without independently shortening or extending treatment. Counseling should preferably be provided when amoxicillin is prescribed or dispensed, supported by concise written or visual educational materials that reinforce dose, frequency, treatment duration, and the risks associated with inappropriate antibiotic use. Targeted education may be particularly important because healthcare professionals are frequently identified as major sources of antibiotic information. In the Ethiopian study, for example, healthcare professionals

were the most commonly reported source of information about antibiotics. This supports the potential role of physicians, pharmacists, and other healthcare personnel at Puskesmas Bojongloa in providing standardized antimicrobial-use counseling. Repeated education during prescribing and dispensing encounters may help address the specific gaps identified in this study rather than relying solely on general health promotion. Although the present descriptive study cannot demonstrate that education would directly reduce antimicrobial resistance, its findings provide a practical basis for prioritizing patient education on antibiotic resistance, adherence to prescribed regimens, avoidance of self-medication, and rational amoxicil This study has several limitations that should be considered when interpreting the findings. First, respondents were recruited using accidental sampling, meaning that participants were selected based on their availability during the data-collection period rather than through probability sampling. This approach may introduce selection bias and may not fully represent all outpatients at Puskesmas Bojongloa. Second, the study was conducted at a single primary healthcare center, which limits the applicability of the findings to other healthcare facilities with different patient characteristics, prescribing practices, or educational environments. Third, the sample size was calculated using the Slovin formula with a 10% margin of error, which provides a relatively broad level of precision and further limits the representativeness of the estimates. Therefore, the findings should be interpreted as describing the knowledge of the 91 surveyed outpatients at Puskesmas Bojongloa rather than as estimates that can be generalized to the wider community or to all primary healthcare populations.lin use.

Conclusions

Based on the results of this study on the level of knowledge of outpatients regarding the use of the antibiotic amoxicillin at Puskesmas Bojongloa, involving 91 respondents, it can be concluded that patients' level of knowledge remains relatively low. This is demonstrated by the knowledge-level categories among respondents: the poor category comprised 35 respondents (38.5%), the fair category 31 respondents (34.0%), and the good category 25 respondents (27.5%). Most respondents were already aware that antibiotics are used to treat bacterial infections and must be taken as prescribed by a physician. However, many respondents still did not understand that antibiotics are not intended for all illnesses, should not be discontinued before completion, and had limited understanding of antibiotic resistance. Increased patient education regarding the correct use of the antibiotic amoxicillin is therefore needed to prevent irrational antibiotic use and reduce the risk of antibiotic resistance.

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Conflicts of Interest

The authors declare no conflict of interest.

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