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# Assessment of Knowledge and Awareness Among Clients Attending Primary Health Care Centers Regarding the Use of Non-Prescription Antibiotics in Iraq

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**Research Article**

**Keywords:** Antibiotics, Knowledge, Awareness, Self-medication, Antimicrobial Resistance, Primary Health Care, Iraq

**Posted Date:** April 17th, 2026

**DOI:** https://doi.org/10.21203/rs.3.rs-9312713/v1

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**Additional Declarations:** No competing interests reported.

# Abstract

**Background:** Inappropriate use of antibiotics, particularly non-prescription use, is a major global public health challenge, especially in developing countries, and plays a significant role in the emergence of antimicrobial resistance. This study aimed to assess the level of knowledge and awareness among clients of primary health care centers regarding the risks of non-prescription antibiotic use and its association with sociodemographic characteristics.

**Methods:** This descriptive cross-sectional study was conducted among 200 clients attending eight primary health care centers in Al-Diwaniyah Province, Iraq, between January 18 and February 1, 2026. Participants were selected using convenience sampling. Data were collected [illegible] a structured questionnaire adapted from the Antibiotic Knowledge and Consumption Tool (AKCT) and analyzed using SPSS version 26. Descriptive statistics and inferential analyses, including multiple linear regression, were applied.

**Results:** The mean knowledge score was 0.50 ± 0.18, indicating a moderate level of knowledge, while the mean awareness score was 0.77 ± 0.18, reflecting a relatively high level of awareness among participants. Several misconceptions were identified, including the use of antibiotics for viral infections and premature discontinuation of treatment. Educational level was the strongest predictor of both knowledge ($\beta=0.448$, $p<0.001$) and awareness ($\beta=0.439$, $p<0.001$). Income was identified as a significant predictor of awareness ($\beta=0.229$, $p=0.001$).

**Conclusion:** Despite a relatively acceptable level of awareness, sufficient knowledge regarding optimal antibiotic use was not identified. Therefore, implementing targeted educational interventions and strengthening regulatory policies on non-prescription antibiotic dispensing appear necessary to reduce antimicrobial resistance.


# Introduction

Antibiotics are considered one of the most significant achievements of modern medicine, playing a crucial role in the treatment of bacterial infections and in reducing mortality associated with these diseases(1). However, the widespread and often irrational use of these medications worldwide, particularly in low- and middle-income countries, has become a major public health concern(2). According to global reports, antibiotic consumption increased by more than 65% between 2000 and 2019, with the most substantial growth observed in developing countries. It is also estimated that antimicrobial resistance was associated with approximately 4.95 million deaths globally in 2019 (3). Furthermore, nearly 50% of antibiotic use worldwide is considered inappropriate or unnecessary, which significantly contributes to the acceleration of antimicrobial resistance(4).

One of the most important factors contributing to this inappropriate use is the consumption of antibiotics without a medical prescription (5, 6). This phenomenon is particularly prevalent in low- and middle-income countries due to factors such as easy access to pharmacies, high healthcare costs, and

weak regulatory enforcement. Non-prescription use is often associated with incorrect dosing, inappropriate drug selection, and premature discontinuation of treatment, all of which can have serious consequences for both individual and public health(4).

Numerous cross-sectional studies conducted in various countries have shown that public knowledge regarding antibiotics is inadequate and that their misuse is common. For example, in a study conducted in Kuwait, reported that approximately half of the participants had a low level of knowledge regarding antibiotic use, and self-medication with antibiotics was observed in about 27.5% of individual (7). Similarly, in a cross-sectional study in Thailand, demonstrated that misconceptions about antibiotic use remain widespread, with more than half of participants believing that antibiotics are effective for viral infections such as the common cold. This study also found a significant association between antibiotic use and educational level(8). These findings highlight the gap between individuals' knowledge and appropriate antibiotic use behaviours.

In Iraq, existing evidence indicates that self-medication with antibiotics and their dispensing without prescription are highly prevalent. Studies have shown that a considerable proportion of the population uses antibiotics without consulting a physician, and pharmacies often provide these medications without a prescription. For instance, some reports suggest that approximately 63% of individuals engage in self-medication with antibiotics (9). Based on the above, insufficient public awareness of the potential risks associated with excessive antibiotic use plays an important role in the spread of antimicrobial resistance among the Iraqi population. In addition, the limited evidence regarding knowledge and awareness of self-medication with antibiotics, along with the existing knowledge gap, may hinder the development of effective interventions and targeted health policies. Therefore, this study was conducted to assess the level of awareness among clients attending primary healthcare centers regarding the risks of non-prescription antibiotic use and to determine its association with their demographic characteristics.

## Research Objectives

The primary objective of this study was to evaluate the levels of knowledge and awareness regarding non-prescription antibiotic use among clients attending Primary Health Care Centers (PHCCs) and to examine their association with sociodemographic characteristics.

Research Questions

This study aimed to address the following research questions:

1. Is there an association between sociodemographic characteristics and the level of knowledge regarding antibiotic use among PHCC clients?
2. Is there an association between sociodemographic characteristics and the level of awareness regarding the risks of non-prescription antibiotic use?

3. Is there a relationship between knowledge and awareness levels regarding antibiotic use among PHCC clients

## Methods

# Study Design and Setting:

This study was conducted as a descriptive cross-sectional study among clients attending Primary Health Care Centers (PHCCs) in Al-Diwaniyah Province, Iraq. A total of eight PHCCs, which provide preventive and curative services to the general population, were selected as the study setting.

## Sampling and Data Collection:

Samples were collected from clients attending the selected centers over a 14-day period, from January 18 to February 1, 2026. The researchers were present in the waiting areas of the centers and invited eligible participants to take part in the study.

Participants were selected using a convenience sampling method based on their availability and willingness to participate. This method was chosen due to ease of access to participants, time constraints, and the cross-sectional and exploratory nature of the study.

**Inclusion Criteria**:

1. Clients attending one of the eight Primary Health Care Centers (PHCCs) during the data collection period.
2. Having a basic understanding of antibiotics (i.e., ability to respond to the questionnaire).
3. Willingness to participate in the study and providing informed consent.

**Exclusion Criteria**:

1. Healthcare professionals (physicians, pharmacists, and nurses), due to their specialized knowledge, which could introduce bias into the study results.

## Sample Size:

The sample size was determined using Cochran's formula for cross-sectional studies

$$n = \frac{Z^2 \times p(1-p)}{d^2}$$

The sample size was determined based on the results of a similar study conducted in Baghdad by Al-Taie et al(10). Considering a possible attrition rate, the final sample size was set at 200 participants.

Data were collected using a structured questionnaire developed based on previous studies and adapted from the Antibiotic Knowledge and Consumption Tool (AKCT). This instrument was originally developed and psychometrically validated by Hasan et al. and was translated and culturally adapted into Arabic. In the original study, the validity of the tool was confirmed through exploratory factor analysis, and its multidimensional structure was established. The reliability of the instrument was also reported with a Cronbach's alpha of 0.85, indicating good internal consistency(11). In the present study, a pilot study was conducted to assess reliability, in which the questionnaire was administered to 29 participants. The Cronbach's alpha coefficient was found to be 0.932, indicating excellent internal consistency. The questionnaire items were divided into three domains. The first section included participants' demographic characteristics, the second section consisted of 20 items assessing general knowledge about antibiotics, and the third section included 9 items evaluating awareness of the risks associated with antibiotic use. Responses were recorded in a dichotomous format (Yes/No). Some negatively worded items in the knowledge section were reverse-coded prior to analysis to ensure consistency in scoring. Due to the absence of standardized cut-off points in the original tool, knowledge and awareness levels were categorized based on the percentage of total scores into three levels: poor (< 50%), moderate (50–75%), and good (> 75%).The collected data were analysed using SPSS software version 26.

Descriptive statistics, including frequency, percentage, mean, and standard deviation, were used to summarize the data. The Chi-square test was applied to examine the association between sociodemographic variables and levels of knowledge and awareness. Furthermore, multiple linear regression analysis was performed to identify predictors of knowledge and awareness levels. In this analysis, sociodemographic variables including age, gender, marital status, education level, place of residence, monthly income, and participation in training courses were entered as independent variables. Model fitness was assessed using the coefficient of determination ($R^2$) and the F-test. A p-value of less than 0.05 was considered statistically significant.

# Results

A total of 200 clients from Primary Health Care Centers participated in this study. The average age of the participants was 32.96 ± 12.69 years. Most participants had a university-level education (43.0%), followed by those with secondary (27.5%) and primary education (18.5%). The majority of the sample resided in urban areas (93.5%).

In terms of gender distribution, males accounted for 51.0% of the participants, while females represented 49.0%. Regarding marital status, most participants were married (63.5%), with single individuals making up 30.5% of the sample. Concerning economic status, 51.0% of participants reported having sufficient income, 36.5% indicated that their income was barely sufficient, and 12.5% reported insufficient income. Further details of the participants' demographic characteristics are provided in Table 1.

Table 1
Sociodemographic Characteristics of Participants (n = 200)

| Variable | Category | Frequency (n) | Percentage (%) |
|---|---|---|---|
| **Gender** | Male | 102 | 51.0 |
| | Female | 98 | 49.0 |
| **Marital Status** | Single | 61 | 30.5 |
| | Married | 127 | 63.5 |
| | Widowed | 7 | 3.5 |
| | Divorced | 5 | 2.5 |
| **Education Level** | Illiterate | 16 | 8.0 |
| | Primary | 37 | 18.5 |
| | Secondary | 55 | 27.5 |
| | University | 86 | 43.0 |
| | Postgraduate | 6 | 3.0 |
| **Residence** | Rural | 12 | 6.0 |
| | Urban | 187 | 93.5 |
| **Monthly Income** | Adequate | 102 | 51.0 |
| | Barely Adequate | 73 | 36.5 |
| | Inadequate | 25 | 12.5 |

The findings related to participants' knowledge of antibiotics are presented in Table (2). Overall, the findings related to participants' knowledge showed that knowledge levels varied across different domains. The highest proportion of correct responses was associated with awareness of the risks of non-prescription antibiotic use (77%), as well as recognition of side effects and the risks related to sharing medications (76%). In addition, 72% of participants were familiar with the concept of antibiotic resistance.

In contrast, the lowest proportion of correct responses was related to items concerning inappropriate antibiotic use behaviors. Only 17% of participants correctly answered questions regarding the use of antibiotics for the common cold and the discontinuation of antibiotics after symptom improvement. Furthermore, knowledge regarding the ineffectiveness of antibiotics against viral infections (35%) and the fact that not all infections require antibiotic treatment (36%) was relatively low.

**Table (2): Participants' Knowledge About Antibiotics (n = 200)**

| No. | Statement | Correct Response (%) |
|---|---|---|
| 1 | Antibiotics are effective against viruses | 35 |
| 2 | Antibiotics are used only for bacterial infections | 51 |
| 3 | All infections require antibiotics | 36 |
| 4 | Overuse of antibiotics leads to resistance | 61 |
| 5 | Awareness of antibiotic resistance | 72 |
| 6 | Using antibiotics without a prescription is unsafe | 77 |
| 7 | Stopping antibiotics early is safe | 50 |
| 8 | Sharing antibiotics is dangerous | 76 |
| 9 | Antibiotics can have side effects | 76 |
| 10 | The body can control some mild infections without antibiotics | 76 |
| 11 | Storing leftover antibiotics for future use | 56 |
| 12 | Taking antibiotics based on others' advice | 50 |
| 13 | Buying antibiotics without a prescription | 31 |
| 14 | Using the internet to choose antibiotics | 45 |
| 15 | Using antibiotics for the common cold | 17 |
| 16 | Stopping antibiotics after feeling better | 17 |
| 17 | Changing the antibiotic dosage | 45 |
| 18 | Antibiotics are useful for all diseases | 31 |
| 19 | Recommending antibiotics to others | 50 |
| 20 | Reading the medication leaflet before use | 61 |

The results regarding participants' awareness of the risks associated with non-prescription antibiotic use are presented in Table (3), indicating a relatively high level of awareness in this area. The highest proportion of correct responses was related to the recognition of insufficient public awareness (91%) and the role of education in reducing inappropriate antibiotic use (90%). Furthermore, a large proportion of participants emphasized the need for stricter regulation of antibiotic sales (88%) as well as the ease of obtaining antibiotics without a prescription (88%). However, awareness was lower in certain areas. Only 61% of participants were aware of the potential for the transmission of antibiotic resistance between individuals and across countries, and 66% were informed about the serious consequences of antibiotic resistance.

**Table (3): Participants' Level of Awareness in the Study (n = 200)**

| No. | Statement | Correct Response (%) |
|---|---|---|
| 1 | Antibiotic resistance is a global problem | 73 |
| 2 | Resistance can lead to diseases becoming untreatable | 66 |
| 3 | Greater regulation of antibiotic sales is necessary | 88 |
| 4 | Antibiotics are easily accessible without a prescription | 88 |
| 5 | Antibiotic resistance can be transmitted between individuals | 61 |
| 6 | Education can reduce inappropriate use | 90 |
| 7 | There is a lack of awareness in the community | 91 |
| 8 | Increased antibiotic use leads to increased resistance | 81 |
| 9 | Antibiotic resistance can spread between countries | 61 |

Table 4 presents the overall scores for knowledge and awareness. Participants demonstrated a moderate level of knowledge (0.50 ± 0.18), while their awareness of the risks related to non-prescription antibiotic use was comparatively higher (0.77 ± 0.18). The contrast between these values emphasizes the discrepancy between what individuals know and what they are aware of.

Table 4
Mean Scores Obtained for Participants' Knowledge and Awareness Levels

| Variable | Minimum | Maximum | Mean ± Standard Deviation |
|---|---|---|---|
| Knowledge | 0.05 | 0.95 | 0.50 ± 0.18 |
| Awareness | 0.11 | 1.00 | 0.77 ± 0.18 |

The findings from the multiple linear regression analysis showed that the model predicting knowledge was statistically significant ($F = 10.309$, $p < 0.001$), accounting for 27.3% of the variance ($R^2 = 0.273$). Among all variables, educational level emerged as the most influential factor ($\beta = 0.448$, $p < 0.001$), suggesting that individuals with higher education tended to have better knowledge. Participation in antibiotic-related training was also significantly related to knowledge ($p = 0.015$). In contrast, no meaningful associations were observed between knowledge level and variables such as age, gender, marital status, place of residence, or monthly income ($p > 0.05$). Similarly, the regression model for awareness was also statistically significant ($F = 7.348$, $p < 0.001$), explaining 21.1% of the variance in awareness scores ($R^2 = 0.211$). Among the variables, educational level was again identified as the strongest predictor of awareness ($\beta = 0.439$, $p < 0.001$), indicating that higher educational attainment was significantly associated with higher awareness. Furthermore, monthly income showed a significant association with awareness level ($\beta = 0.229$, $p = 0.001$). In contrast, variables such as gender, age, marital status, place of residence, and participation in training courses were not significantly associated

with awareness level ($p > 0.05$).The results of the linear regression analyses for predicting knowledge and awareness are presented in Table (5), and the model fit indices are shown in Table (6).

**Table (5): Results of Linear Regression Analysis for Predicting Knowledge and Awareness**

| Variable | Knowledge (β) | p-value | Awareness (β) | p-value |
|---|---|---|---|---|
| Gender | -0.020 | 0.751 | -0.028 | 0.667 |
| Age | -0.032 | 0.658 | 0.092 | 0.228 |
| Marital Status | -0.001 | 0.984 | -0.105 | 0.171 |
| Education Level | 0.448 | < 0.001 | 0.439 | < 0.001 |
| Place of Residence | -0.032 | 0.619 | -0.042 | 0.525 |
| Monthly Income | -0.045 | 0.481 | 0.229 | 0.001 |
| Participation in Training | -0.160 | 0.015 | 0.011 | 0.869 |

**Table (6): Model Fit Indices for Regression Analysis**

| Index | Knowledge | Awareness |
|---|---|---|
| $R^2$ | 0.273 | 0.211 |
| Adjusted $R^2$ | 0.247 | 0.183 |
| F | 10.309 | 7.348 |
| p-value | < 0.001 | < 0.001 |

# Discussion

The findings of the present study showed that participants had a moderate level of knowledge regarding antibiotic use (mean ≈ 0.50), while their awareness of the risks associated with non-prescription use was relatively high (mean ≈ 0.77). These results indicate a gap between knowledge and awareness, suggesting that although individuals are somewhat aware of the risks of antibiotics, their accurate and comprehensive understanding of proper antibiotic use remains insufficient. Based on a study conducted in China, several factors may explain this gap between knowledge and awareness. First, misconceptions and insufficient information among the public particularly regarding the role of antibiotics in treating viral infections reflect weaknesses in health education. Second, antibiotic use behaviour is often influenced more by prior experiences, attitudes, and easy access to medications than by accurate knowledge. Many individuals tend to reuse previous prescriptions or keep antibiotics at home for future use (12). Additionally, socioeconomic status and educational level play an important role in shaping individuals' knowledge and awareness. People with higher socioeconomic status tend to have better knowledge, whereas individuals from disadvantaged backgrounds may have limited accurate knowledge despite

some level of awareness (13). These findings are consistent with studies conducted in developing countries. For example, a study in India reported that public knowledge about antibiotics was generally low, and many individuals lacked adequate awareness of antimicrobial resistance, while inappropriate practices such as over-the-counter purchase and reuse of old prescriptions were common .(14). Similarly, a study in Bangladesh found that poor knowledge was significantly associated with inappropriate antibiotic use and non-prescription dispensing, highlighting that general awareness alone is insufficient and that accurate knowledge plays a crucial role in behavior change (15). In the present study, several misconceptions were also observed among participants, including the use of antibiotics for viral infections and premature discontinuation of treatment. These findings are consistent with previous studies showing that a considerable proportion of individuals use antibiotics for conditions such as the common cold and influenza and fail to complete the full course of treatment. Such behaviours are among the major contributors to antimicrobial resistance (16). Educational level was identified as one of the most important predictors of knowledge and awareness regarding antibiotic use. The present findings are consistent with previous research indicating that individuals with higher levels of education tend to have a better understanding of antibiotic use and are more likely to adopt appropriate practices. However, evidence from low- and middle-income countries suggests that misconceptions may still exist even among educated individuals, indicating that current educational strategies may not be sufficiently effective or well-targeted .In addition, income was found to be significantly associated with awareness, emphasizing the influence of economic conditions on health-related behaviors. A study conducted in Yemen reported that low socioeconomic status is a major contributor to inappropriate antibiotic use, with more than 60% of misuse cases linked to financial limitations and restricted access to healthcare services (17). These findings suggest that individuals with limited financial resources are more likely to resort to self-medication and the use of antibiotics without prescription. In contrast, variables such as age, gender, and place of residence were not significantly associated with knowledge and awareness in the current study. This is consistent with findings from research conducted in Iraq, which demonstrated that antibiotic use behaviors are more strongly influenced by attitudes, beliefs, and environmental factors than by demographic characteristics. This may indicate that inappropriate antibiotic use is a widespread issue affecting various population groups rather than being confined to specific subgroups. Another key finding of this study was the positive role of education in improving knowledge levels .Individuals who had participated in educational programs demonstrated different levels of knowledge. However, evidence suggests that awareness alone does not necessarily translate into behavioural change. For example, a study conducted in Iraq reported that despite high awareness of antimicrobial resistance among pharmacists, more than 76% continued to dispense antibiotics without prescription. Similarly, in a study conducted in Yemen, although more than 98% of pharmacists were aware of the risks of misuse, this awareness did not result in appropriate practices(18). This discrepancy between knowledge and behaviour may be explained by several factors, including patient pressure to obtain antibiotics (19), economic incentives, and weak enforcement of regulatory policies (20, 21). In particular, studies have shown that patient demand and concerns about financial loss are among the key drivers of continued illegal dispensing of antibiotics by pharmacists (18, 22). The findings of this study show that increasing people's understanding of

antibiotics, along with raising awareness of their risks, can contribute to more appropriate use. However, improving antibiotic use cannot rely on education alone. It requires a broader strategy that combines educational efforts, stronger control of antibiotic distribution, and attention to social and economic conditions that influence people's behaviour.

# Limitations of the Study

This study has several limitations that should be taken into account when interpreting the results. Although efforts were made to minimize potential sources of bias, some limitations could not be completely avoided. The cross-sectional nature of the study prevents establishing causal relationships and only allows the identification of associations between variables.

Moreover, the use of convenience sampling may have resulted in selection bias and may restrict the generalizability of the findings to the wider population. Data collection relied on self-reported responses, which are subject to potential biases such as social desirability and recall bias, as participants may not have reported their actual behaviors accurately.

In addition, since the study was conducted in a single province, the findings may not be fully applicable to other regions with different socio-cultural and economic contexts. Although a validated questionnaire was used, the lack of established cut-off points could have affected the categorization of knowledge and awareness levels.

Finally, certain important factors related to antibiotic use such as access to healthcare services, cultural influences, and the role of pharmacies were not examined in detail, even though previous studies suggest that these factors may significantly influence inappropriate antibiotic use.

# Conclusion

Overall, the findings of this study indicate that despite a relatively acceptable level of awareness among participants, insufficient knowledge regarding the appropriate use of antibiotics remains a significant challenge. This suggests that increasing awareness alone is not sufficient to improve antibiotic use practices, and there is a need to enhance practical knowledge and address inappropriate behaviours. In this context, the design and implementation of targeted educational interventions, improvement of health literacy within the community, and strengthening the regulation of non-prescription antibiotic dispensing could play an important role in reducing inappropriate use. Additionally, special attention to populations with lower levels of education may help improve the current situation. Finally, adopting a multifaceted approach at both the individual and healthcare system levels appears essential to effectively address irrational antibiotic use.

# Declarations

**Ethics approval and consent to participate**

This study was approved by the Ethics Committee of the College of Nursing, University of Al-Qadisiyah . The study was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki and CIOMS guidelines.

All participants were informed about the purpose of the study, and written informed consent was obtained prior to data collection. Participation was voluntary, and participants were assured of the confidentiality and anonymity of their information.

**Funding**

The authors received no specific funding for this study.

**Availability of data and materials**

The datasets generated and analyzed during the current study are available from the corresponding author upon reasonable request.

**Competing interests**

The authors declare that they have no competing interests.

**Clinical trial number**

Not applicable.

**Authors' contributions**

MJ and HE conceptualized the study, designed the methodology , ABK collected data and HE analyzed the data, and drafted the manuscript. MJ supervised the research process, critically revised the manuscript, and approved the final version. HE assisted with statistical analysis and interpretation of results. All authors read and approved the final manuscript.

**Acknowledgments**

The authors would like to thank all participants who voluntarily took part in this study. Their cooperation and willingness to contribute were essential for the successful completion of this research.

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