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Knowledge, attitude, and practice study on antimicrobial use and resistance among Karbala university students

Kawkab. Abdullah Hussein Alsaadi*

Department of Biology, Faculty of Science, Kerbala. University, Iraq

Abstract

Antimicrobial resistance is a severe public health concern that poses a threat to the advancements in the treatment of infectious diseases. This study aims to evaluate university students' knowledge, attitudes, and behaviors regarding the usage of antibiotics and antibiotic resistance. An online survey distributed via social media channels was used in a cross-sectional study. The period was from 26 November 2022 to 28 February 2023. A total of 180 questionnaires from 76 non-medical and 104 medical students were gathered. The data was analyzed using the t-test and chi-square test. It was discovered out of 38 queries, all of which are quite significant. While non-medical students scored lower on everything, we found that medical students had superior attitudes and knowledge but less practice. This leads us to the conclusion that medical students knew more about the usage of antibiotics and felt more positively about it than non-medical students, although medical and non-medical students apparently showed less practice. Improving their knowledge may help them strengthen their antibiotic practice. It is advised that university students from all faculties, particularly those majoring in subjects other than medicine, be given access to a brief training session or workshop. The significance of using antibiotics correctly and the negative consequences of using them improperly should be covered in the training.

Keywords: Antibiotic resistance, Knowledge, Attitude, and Practice (KAP), Karbala university students

1.Introduction

For a long time, antibiotics have been referred to as "magic bullets" (Fischbach & Walsh, 2009). According to Hutching et al. (2019), penicillin has increased the average human life expectancy and saved millions of lives since its discovery in 1928. The wonders of antibiotics notwithstanding, what are they? Typically created by bacteria or fungus, antibiotics are tiny compounds that destroy microorganisms without endangering the patient (Guilfoile, 2019). Antimicrobial resistance, however, indicates that these miracle cures are not always sufficient to withstand certain significant drawbacks (Fischbach & Walsh, 2009).

Antimicrobial resistance is a serious public health issue that jeopardizes important progress in the management of infectious diseases (Tembo et al., 2022). In recent years, bacterial antibiotic resistance has become a serious concern to public health, despite being a natural process that arises gradually over time through genetic pathways. Around the world, AMR has led to many fatalities, extended hospital stays, needless medicine use, and higher diagnostic costs (Miethke et al., 2021; San Millan, 2018). AMR is projected to have contributed to 4.95 million deaths in 2019, with more than a million deaths directly attributable to antibiotic resistance (Murray et al., 2022). Every year, drug-resistant diseases like MRSA and MDR-TB cause thousands of fatalities. By 2050, AMR could kill 10 million individuals if left unchecked (Tembo et al., 2022).

The reasons resulting in the development of resistance traits in bacterial populations (Fischbach & Walsh, 2009). The problem with antibiotics is not the drugs themselves, which remain effective against diseases. Rather, the issue lies in their overuse or irrational use (Gyssens, 2001). The self-medication purchase of antibiotics without a prescription can contribute to AMR (Banda et al., 2021; Kalungia et al., 2016). In addition, the consumption of animal products from antimicrobial-treated animals contributes to AMR development and spread (Al-Ghamdi et al., 2000).

Antibiotic-resistant microorganisms in the human food chain can result from the use of growth boosters, prophylactics, and therapeutics in animal husbandry (Ahmed et al., 2017). The antibiotic medication colistin (CST) is a member of the polymyxin class. The bacterial cell membrane is the target of its action.

Correspondence: Kawkab. Abdullah Hussein Alsaadi, Department of Biology, Faculty of Science, Kerbala. University, Iraq, **e-mail:** kawkab.alsaadi@uokerbala.edu.iq, **Received:** November 7, 2025 **Accepted:** December 4, 2025

However, its clinical usage was terminated due to its severe toxicity and the availability of more effective medicines; today, it is exclusively utilized in the veterinary sector (Biswas et al., 2012). Multi-drug-resistant bacterial infections have returned to clinical settings as a result of the restricted supply of novel antibiotics (Collignon & McEwen, 2019). Following the reintroduction of CST, reports of resistance in humans were made (Andrade et al., 2020). Animals can act as reservoirs of antibiotic resistance genes (ARGs) and can transmit them to people, as evidenced by the fact that the use of CST in animals has been linked to the development and dissemination of antibiotic resistance mechanisms (Gharaibeh & Shatnawi, 2019; Davis & Sharp, 2020).

Assessing a representative sample of college students' knowledge, attitudes, and behaviors about antibiotics may be a useful strategy for enhancing their use (Kulkarni et al., 2017). Al-Salih and associates studied the attitudes and understanding of Iraqi nursing and dental students at Babylon University about the usage of antibiotics in 2019. According to the study, students lacked the appropriate attitude toward the use of antibiotics, although having sufficient knowledge about how to use them (AL-Salin et al., 2019).

The World Health Organization (WHO) has stressed that new antibiotic additions will lose their effectiveness if people continue to use antibiotics inappropriately. To determine the current public perception and practices regarding antibiotic recommendation, consumption, and resistance, KAP-based research is therefore crucial. These investigations are conducted in a variety of nations and among a range of demographics (Marzan, 2021).

2.Method

To collect information on the knowledge, attitudes, and behaviors of Karbala University students on the use of antibiotics and resistance, this study used a cross-sectional technique (Hutchings, Truman, & Wilkinson, 2019). University students participated in this cross-sectional study between November 26, 2022, and February 28, 2023. Karbala University is one of the Iraqi universities. It is in the city of Karbala, the center of Karbala Governorate, in the Middle Euphrates in Iraq. The university campus is about (6km) from the old city. There are approximately (12 thousand) students studying in (16) colleges.

An online questionnaire was prepared and sent through social media platforms. There were four distinct sections to the questionnaire, each with multiple-choice answers. Arabic was used in its creation. Demographic data (gender, age, civil status, and educational attainment) were provided in the first section. In order to assess students' knowledge of antibiotics and antibiotic resistance, the second component consists of fifteen questions.

The evaluated using (yes, no, or unsure) response. The third section is made up of 12 questions that evaluate the attitude toward antibiotic use and resistance. The evaluation uses (Agree, unsure, and disagree) responses. The fourth section is made up of 12 questions to understand the common practice related to antibiotic intake. The fourth part further evaluated the participants about antibiotic use and what the use of antibiotics is to follow in taking antibiotics. Some had it being answered via multiple electives (Always, often, sometimes, rarely, never). Data was taken from any participant who may meet our requirements. The electronic form in which the data was collected did not show any nominal information.

Data analysis

The whole questionnaire data were reviewed and analyzed using SPSS Statistics, Version 22. By giving a score of 1 for the right response and a score of 0 for the wrong or unclear response, descriptive statistics were used to determine the percentage (%) of applicants who correctly answered the various questions about sociodemographic traits, knowledge, attitude, and practices regarding the use of antibiotics. The Chi-square test for categorical variables and the T-test for variable mean values were employed. $P > 0.05$ in tables denoted statistical significance.

3.Results

Study participants

A questionnaire was published, and the total number of responses to the questionnaire was 180 participants who completed the questionnaire. All responses were approved because they met the

required criteria. Participants were classified into two groups according to their specialties: 57.8% (n= 104) had specializations related to the medical aspect, while the other group, 42.2% (n= 76), were not associated with the medical aspect.

As indicated in Table 1, the percentage of females was 90 (50.5%) and males 14 (7.8%) of those related to medical students (MS), while the percentage of females was 60 (33.3%) and males 16 (8.9%) of those related to non-medical student (NMS). Age of the majority of participants related to (MS) 56 (31.1%) were aged 18-21 years, and it was lower at14 (7.8%) were aged 35-44 years, as for participants related to (NMS) 37 (20.6%) were aged 22-34 years, it was lower at 3 (1.7%) were aged 35-44 years. Moreover, the majority of the participants were related to (MS), with the civil status of 70 (38.9%) single, and they are also in the participants related to (NMS) 55 (30.6%) single. As for the level of education, most of the participants were related to (MS) 29 (16.1%) in the fourth year, and the participants were related to (NMS) 25 (13.9%) in the fourth year.

Table I. Demographic characteristics of 180 subject

Demographic Characteristics	Medical Students (MS) n(%)	Non-Medical Students (NMS) n (%)
Age		
18-21 years	56 (31.1)	36(20.0)
22-34 years	34(18.9)	37(20.6)
35-44 years	14(7.8)	3(1.7)
Gender		
Male	14(7.8)	16(8.9)
Female	90(50.0)	60(33.3)
Civil Status		
Single	70(38.9)	55(30.6)
In a relationship	6(3.3)	7(3.9)
Married	26(14.4)	13(7.20
Other	2(1.1)	1(0.6)
Educational level		
First Year	1(0.6)	4(2.2)
Second Year	21(11.7)	20(11.1)
Third Year	27(15.0)	21(11.7)
Fourth Year	29(16.1)	25(13.9)
Postgraduate	26(14.4)	6(3.3)
Total	104(57.8)	76(42.2)

Knowledge level antibiotic use

The knowledge gap between NMS and MS for 15 questions. For several knowledge-related questions, the proportion of students in health-related majors who correctly answered was higher than that of students in non-health-related majors (K1, K3, K6, K7, K8, K11, K14). These variations in scores were statistically significant for all questions related to knowledge. In question K1, we note that both MS and NMS have high responses (100% vs. 97.37%, P >0.0001). It should be considered carefully for questions K2, K4, K5, K15. Both MS and MS had a low percentage of giving correct answers regarding K15 question (25.96% vs.14.47%, P >0.0001). The percentages of applicants who got correct answers are also shown next to the $\chi 2$and P values.

Attitudes level of antibiotic use

The level of attitudes between MS medical students and NMS non-medical students for eleven questions. Where the percentage of MS who gave right responses was higher than NMS in the majority of questions connected to scenarios such as questions (A1, A2, A3, A4, A5, A6, A7). Except for two questions (A10 and A11), where MS had the largest percentage of MS, these variations in scores were statistically significant for all questions connected to attitudes. We notice in question A4 that both MS and MS had a high answer (97.12% vs. 90.79%, P >0.0001). As for questions A8, A9, and A11, both MS and NMS had a low answer, such as A8 (45.19% vs. 26.32%, P >0.0001). The percentage of participants who got a correct answer is shown along with the P and $\chi 2$

values.

Practice level of antibiotic use

The level of practice between MS medical students and MS non-medical students for twelve questions. Questions (P1, P10, P11, P12) MS had a higher percentage of correct answers than NMS, except for three questions (P2, P3, P5), MS had a higher percentage of correct answers than MS. This difference in scores was statistically significant for all practice-specific questions. We note that both MS and NMS had high responses to question P11 (81.7% vs. 68.4%; P > 0.0001). As for question P3, the MS and NMS scores were significantly reduced from giving the correct answer (10.6% vs. 18.4%; P > 0.0001). The percentage of participants who answered correctly is also shown along with the $\chi 2$ and P values.

Evaluation of overall Knowledge, attitude, and practice results

Compared to the non-medical student group, the medical student group's mean knowledge score was significantly higher (mean = 10.56; error mean = 0.202 vs. mean = 8.91; error mean = 0.233). There was a statistically significant difference in the scores (p-value < 0.0001). The group of medical students had a higher mean attitude score than the group of non-medical students (mean = 7.24; error mean = 0.212 vs. mean = 5.89; error mean = 0.258). A p-value of less than 0.0001 indicated that the score difference was statistically significant. Both the medical and non-medical student groups have low average practice scores (mean = 4.63; error mean = 0.210 vs. mean = 3.29; error mean = 0.217). With a p-value less than 0.0001, this differential score was statistically significant.

4.Discussion

Antimicrobial resistance is a significant threat to public health systems worldwide, not just in developing countries (Founou *et al*., 2017; Prestinaci *et al*., 2015). The emergence of antibiotic-resistant infectious diseases poses a grave threat to the future of healthcare (Chokshi *et al*., 2019). Antibiotic resistance needs to be addressed at the individual, household, and community levels for effective containment and prevention (Tomson et al., 2014).

Demographic attributes pertaining to MS and NMS

In this study, 180 of the participant's responses were considered. We found that females were more involved in those related to MS and NMS than males associated with MS and NMS, but if we compared males from MS and NMS, where males associated with MS 14 (7.8%) were less involved than males related to NMS 16 (8.9%). They also noted that the participation of medical students was 104 (57.8%), more than that of non-medical students 76 (42.2%).

Knowledge regarding antibiotic use by MS and NMS

The findings indicated that medical students possessed superior knowledge compared to non-medical students (i.e., a higher percentage of correct answers in almost all questions). This is in agreement with two studies, one of which was conducted in Italy and the other in the Centre in Chennai (Scaioli *et al*., 2015; Ganesh *et al*., 2014). Medical students had better information than other students. Also, a study was conducted in Malaysia (Haque *et al*., 2019). However, we note that a survey conducted in Jordan had a low result (Suaifan *et al*., 2012).

We noticed that there are misconceptions regarding the knowledge questions, which included three misconceptions in the question (K4, K5, K15). In response to the question regarding the efficacy of antibiotics against viral infections, 46.15% Of Medical Students (MS) recognized that antibiotics are ineffective for such conditions, whereas only 18.42% of non-medical students (NMS) were aware of this fact. The outcome of a nearly identical study performed in China indicated that 64.52% of Medical Students (Ms) selected medications that are ineffective for treating viral infections, in contrast to merely 43.44% of non-medical students (NMS) (p > 0.0001) (Huang et al., 2013). Another misconception is whether antibiotics can be used in fever, as 25.96% of MS knew that it could not be used in the treatment of fever, compared to 14.47% of MS, and this almost agrees in a study conducted in Lebanon (Sakr *et al*., 2020).

Moreover, there are questions about antibiotic use that were answered correctly (i.e., with a high rate)

for both MS and NMS. It seems that 81.1 of the participants knew that antibiotics are used to treat a bacterial infection and that 83.9 of the participants heard about bacterial resistance, meaning that excessive intake of antibiotics leads to bacterial resistance, 82.2% of the participants knew that antibiotics could be used to treat pain and inflammation. And if we compare questions K3 and K4, there is a large discrepancy in the percentage of correct answers. The participants appeared unable to differentiate between bacterial and viral infections, mistakenly believing that medications are effective against both. Notwithstanding the disparities in responses, it was determined that medical students have superior knowledge compared to non-medical students, indicating that a scientific background is significant in relation to knowledge, as evidenced by the means between MS and NMS (mean: 10.65 vs. 8.91 ($p<0.0001$)).

Attitude regarding antibiotics Use by MS and NMS

In the part on attitudes, the results showed that medical students have a better attitude than non-medical students (i.e., a higher percentage of accurate answers to almost the majority of questions). This is in keeping with research conducted in Chinese (Huang *et al*., 2013). However, this is contrary to a study conducted in Bangladesh, where both MS and NMS had better attitudes toward understanding antibiotics (Marzan *et al*., 2021).

And we noticed that there are three wrong positions in the question (A8, A9, A11). In question A8, 45.19% of those with MS do not agree to use antibiotics when symptoms are cold / flu, but 26.32% of those with NMS do not agree with the use of antibiotics. This roughly corresponds to a study in Norwegian (Waaseth *et al*., 2019). In question A9, 49.04% of MS do not agree to stop using antibiotics when they feel better, compared to 19.74% of NMS do not agree, but this is contrary to a study in Lebanon where MS and NMS had a better position as they knew when to stop using antibiotics (Sakr *et al*., 2020). In question A11, MS showed a low position compared to NMS, where 40.38% of MS agreed to use multivitamins as a food supplement after the end of a course of antibiotics, while NMS gave higher answers, where 52.63% agreed to use vitamins as a food supplement.

As for question A10, MS had the lowest percentage of correct answers from NMS (58.65% MS, 61.84% NMS1). Despite that, both of them showed a moderate position as they agreed that attention should be paid to the type of food we eat because there is a relationship between antibiotics and food consumed. Moreover, MS showed a better position than NMS in the rest of the questions, where 72.12% of MS knew that antibiotic resistance is a problem in Iraq, and 87.50% of MS agreed that antibiotic resistance affects you and your family's health. However, in question A4, both MS and NMS showed a high position, with over 94% believing that it is necessary to have more information about antibiotics. This roughly corresponds to a study in the UAE (Jairoun *et al*., 2019). We note from all of this that medical students have better attitudes than non-medical students, as it shows that better knowledge is linked to a better attitude. where it was average between MS and NMS (mean: 7.24 vs 5.89 ($p<0.0001$)).

Practice regarding antibiotics Use by MS and NMS

In the practice section, the results showed that both medical students and non-medical students had poor practice (i.e., a lower percentage of right answers to practically all questions). This conforms to a study conducted in Italy, where medical students had inappropriate actions even when they had a suitable succession. Besides knowing, antibiotics do not practice what they know (Scaioli *et al*., 2015). This contrasts with a study in Nepal, where MS had much better practices than NMS (Shah *et al.*, 2019).

We noticed that there are alarming results in the practice of using antibiotics, especially their excessive use in treating different symptoms of respiratory infection between MS and NMS; in question P3, only 13.9% of students do not recommend the use of antibiotics in the treatment of bronchitis, in P4 19.4 % of students often use antibiotics in the treatment of pneumonia, in P8 28.9% of students never use antibiotics when there are symptoms of nasal obstruction with headache, and this indicates that more than half of university students overuse antibiotics in treating these symptoms, This is roughly consistent with a study conducted in Nigerian that showed a high consumption of antibiotics among university students (Lgbeneghu, 2013). Our study also revealed

that 15.4% of MS patients never use antibiotics to treat colds, and 30.8% sometimes use antibiotics to treat sore throat symptoms, this corresponds to a study conducted in China, where 13.6% and 15.3% Of MS they are used to treat colds and sore throats (Huang et al., 2013). But this contradicts a study conducted in Iran, where 100% of the participants knew that antibiotics were not used to treat colds and viral infections (Jorak *et al*., 2014).

On the other hand, our study showed that 79.8% of MS patients know the antibiotics that they use should be under the doctor's advice, and also 81.7% use the antibiotics under a doctor's prescription, and this contradicts a study conducted in the UAE (Jairoun et al., 2019). They were using antibiotics not under the doctor's instructions, even though MS was They have better knowledge and attitudes than NMS, we thought they would have practice, but this is the opposite of what we expected as they had low practice and also NMS, where it was average between MS and NMS (mean: 4.63 vs. 3.29 ($p< 0.0001$)).

The results of this study recommend providing a training course or a short workshop for university students from all faculties, especially students with non-medical majors, describing to them the importance of the proper use of antibiotics and the harmful effects of improper use. We also recommend awareness campaigns about the dangers of antibiotic resistance through the media and social communication. We also note that there is an urgent need for physicians to share their knowledge regarding the use of antibiotics with patients because it helps ensure the rational use of antibiotics and thus works to reduce the spread of antibiotic resistance. We also call for conducting other studies in different social groups in Karbala governorate regarding knowledge, approval, and practice of antibiotic use and resistance.

Ethical approval

The study protocol, the subject information, and the consent form were reviewed and approved by a local ethics committee according to document number 154 on 4-6-2024.

5.Conclusion

In this study, which dealt with KAP on the use of antibiotics among university students, the results showed that medical students had better knowledge and also better attitudes in the use of antibiotics than non-medical students, despite that, both medical and non-medical students showed low practice in terms of Misuse of antibiotics, although they were using antibiotics through a doctor's prescription, i.e., lack of self-medication, it seems that they were not complying with the prescribed treatment. As for non-medical students, low results were shown in all questions. From this, we conclude that improving their knowledge may help them to fortify their practice of antibiotics.

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