Research Article

# Knowledge, attitude, and practice of medical doctors toward antibiotic resistance in outpatient clinics in Baghdad hospitals

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## ABSTRACT

**INTRODUCTION**: Antibiotics were the most frequently prescribed medications in Iraq. Insufficient knowledge, attitude, and practice of the medical doctors toward antibiotics may develop resistant infections to the prescribed antibiotics. Antibiotic overuse, incorrect dose, and extended duration are some of the leading causes of antibiotic resistance.

**OBJECTIVE**: to find out medical doctors` knowledge, attitude, and practice about antibiotic resistance and to determine factors that may lead to insufficient knowledge, attitude, and practice about antibiotic resistance.

**METHODS**: a cross-sectional study was conducted in Baghdad, including all the medical doctors working in the outpatient clinics of the selected hospitals. The data had been collected through the distribution of a well-designed structured questionnaire.

**RESULTS**: research results showed that (1000) one thousand medical doctors had participated in this study; the response rate was 75.06%. The knowledge answers percentage was 87.2% unacceptable and 12.8% acceptable, the attitude answers score, 78% were with a positive score and 22% negative and the scores of the practice answers, 57% were with a puny score, and 43% for good.

**CONCLUSION**: Knowledge about antibiotic resistance among Iraqi doctors working in the main hospitals in Baghdad was unacceptable. Although the attitude towards antibiotic resistance was positive, the practice was poor in the majority.

**Key words:** knowledge, attitude, practice, antibiotic resistance, medical doctors, Iraq.

## INTRODUCTION

An Antibiotic is a type of antimicrobial substance active against bacteria by destroying or slowing down bacterial growth. They are essential and frequently prescribed in hospitals because of their effectiveness and lifesaving benefits.[1]

**Antibiotic consumption**: Consumption of antibiotics widely varies among countries. In 2018, the World Health Organisation published antibiotics consumption surveillance. The analysed data were collected from 65 countries and measured by defined daily doses per 1,000 inhabitants per day. Mongolia has had the highest consumption with a rate of 64.4%, and Burundi was the lowest at 4.4%. *Amoxicillin* and *Amoxicillin/clavulanic acid* were the most frequently consumed.[2] Reports from Iraq showed that around half, 45.8%, of the consumed antibiotics were dispensed without a prescription. Ninety-five per cent of the consumed antibiotics were oral dosage forms, 5% were parenteral dosage forms, and the total cost of consumed antibiotics was more than nine million US dollars.[3]

**Antibiotic misuse**: inappropriate antibiotic prescription and antibiotic overuse have contributed to the emergence of antibiotic-resistant bacteria. Many antibiotics are frequently prescribed to treat symptoms or diseases which do not respond to antibiotics or are likely to resolve without treatment.[4] The common forms of antibiotic misuse include failure to take the entire prescribed course of the antibiotic and incorrect dosage and administration.[5]

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**Antibiotic resistance**: antimicrobial resistance (ABR) is increasing globally. Increased ABR nowadays is considered one of the most critical concerns for public health worldwide. A study from Iraq has shown that infection with multidrug-resistant organisms, both gram-positive and gram-negative bacteria, is increasing in number,[6] raising the challenges faced by medical doctors and health institutions.[7] Insufficient medical doctors` knowledge, attitude, and practice (KAP) towards antibiotics may contribute to the development of ABR.[8]

In 2017, the World Health Organization (WHO) revealed that medical doctors were not strictly committed to the national guidelines.[9] WHO had listed Iraq as a less developing country and far behind the comprehensive governance of antimicrobial resistance (AMR),[9] besides the fact that the Iraqi medical doctors` attitude and practice in the last decade had been directed commercially, especially in private clinics.[10] The education curriculum in medical colleges and continuous medical education (CME) programs are still ineffective in decreasing antibiotic misuse, with insufficient legislation preventing inappropriate antibiotic prescription.[10]

To achieve the ultimate goal of controlling antibiotic resistance, we need to have baseline data about the use of antibiotics in Iraqi hospitals and medical doctor's awareness of antibiotic resistance and misuse. The objective of this study was to explore the knowledge, attitude, and practice of medical doctors working in outpatient clinics in some big hospital in Baghdad about antibiotic resistance (ABR), and to determine factors that may effect them.

## METHODS

**Setting and study design**: A cross-sectional study was conducted in 2019 in many hospitals in Baghdad.

**Ethical consideration**: The Arab Board scientific committee approved the study protocol. Permission was taken from the Iraqi Ministry of Health, relevant health directorates and hospital administrations. Oral consent was taken from each participant. Data were used only for the study, and confidentiality was maintained throughout the stages of the study.

**Targeted Population**: Medical doctors working in the outpatient clinics of the selected fourteen major governmental hospitals in Baghdad were enrolled in this study. The hospitals chosen were Al-Kindy Teaching Hospital, Baghdad Medical City Teaching Hospital, Ghazi Al-Hariri Teaching Hospital for Specialised Surgeries, Children welfare Teaching Hospital, Medical City Specialised Plastic Surgery Teaching Hospital, Al-Numan Teaching Hospital, Al-Imam Ali General Hospital, Al-Shaheed Al-Sadr General Hospital, Al-Ilweya Obstetrics and Gynaecology Teaching Hospital, Al-Ilweya Paediatrics Teaching Hospital, Al-Imamain Al-Kadhumain Teaching Hospital, Al-Karama Teaching Hospital, Al-Yarmouk Teaching Hospital, and The Child Central Teaching Hospital.

**Inclusion criteria and exclusion criteria**: We included all medical doctors except rheumatologists, radiologists, and anesthesiologists who are not routinely prescribing antibiotics in their clinical practice.

**Sampling and sample size**: In Baghdad, there are three health directorates, Al-Rasafa, Al-Karkh, and Medical City. All major hospitals of the three health directorates were selected; four major hospitals from Al-Karkh Health Directorate, six from Al-Rusafa Health Directorate, and four from Medical City Directorate. Medical doctors working in the outpatient clinics available at the time of the study have been included. We used the multi-stage cluster sampling to select 1361 medical doctors of both genders, all ages, graduation levels, certification backgrounds, and specialities apart from the excluded three disciplines of non-antibiotic prescribers.

**Tools of the study**: The data had collected through the distribution of a well-designed structured questionnaire that included four parts: Doctors' characteristics, knowledge, attitude and practice questionnaires. The questionnaire had based on previous pieces of literature.[11-13] The questionnaire has been edited,

reviewed, and revised by an assigned panel of experts to meet the national needs. A pilot test was conducted on 25 doctors to test that the questionnaire was clear and easily understandable and estimate the time needed for answering its questions. All those 25 doctors had been excluded from the research results.[14]

***Questionnaire part one*** included **1)** the Socio-demographic characteristics like age in years, gender, and department and/or speciality. **2)** Occupational characteristics like Educational level (Bachelor, Diploma, Master, Board, and/or PhD), Job title (Residents, Board student, Specialist, Consultant), Career duration in years, Workdays per week, and the average number of patients seen per day.

***Questionnaire part two***: included 14 questions testing medical doctors' knowledge about antibiotics and their resistance in antibiotics classifications, leading causes of antibiotics resistance, antibiotics misuse, knowledge about antibiotics resistance, control of antibiotic resistance, indications of using antibiotics, dosage and frequency of use, knowledge of antibiotics prescription, antibiotics effectiveness, antibiotics interaction, allergic reactions to antibiotics, and antibiotics safety. We assigned 1 for each correct answer and 0 for each wrong answer. We considered the knowledge acceptable if the score was seven and above, while it is unacceptable if the total score is less than seven. The interpretation is based on the quartiles, in which unacceptable were assigned for < first and second quartiles, while acceptable were given for ≥ the third and fourth quartiles.[15-17]

***Questionnaire part three***: A set of 12 statements testing medical doctor's attitudes toward regular training and education about antimicrobial prescription, Continuous medical education regarding antibiotic resistance, over and under-prescription, antibiotic prescription attitude, inappropriate antibiotic selection, antibiotic resistance control, antibiotic duration, attitude toward antibiotic misuse, antibiotics dosage, awareness of antibiotic resistance, confidence in knowledge and practice with an antibiotic prescription, and confidence in knowledge and practice with antibiotic resistance problems. Each statement was graded according to 3 points Likert scale (agree, neutral, and disagree). For each statement, the response was scored from 1 to 3, with a higher score for a more favourable attitude. The total scores ranged from 12 to 36 marks. Attitude scores were rated as positive when the participant gained ≥18 marks and negative when they gained <18.[15-17]

***Questionnaire part four***: included 12 questions to assess factors influencing the practice of antimicrobial therapy; the usual duration of empiric antibiotic therapy, antibiotic prescription practice, the cost-effectiveness of prescribed antibiotics, factors affecting antibiotic prescription, rational antibiotic prescription, controlling antibiotics misuse, adherence to the prescription guidelines, inappropriate antibiotics prescription, diagnostic investigations when prescribing antibiotics, antibiotic prescription indications, controlling antibiotic resistance, and updating their information and continuous medical education. Responses to the questions in this part were "always", "sometimes" or "never". We assigned the answer a score of 1-3. The score of practice ranged from 12 to 36 marks. The practice score was good when the participant gained ≥18 marks and poor when the participant gained <18.[15-17]

**Data Collection**: Researchers visited each selected hospital and got a list of doctors working in the outpatient clinics on the day of the visit. The questionnaire forms had distributed among the participants in the early morning and collected at the end of the workday. Data collection from each selected hospital continued for a month to cover the entire monthly schedule of the medical doctors in the outpatient clinics. The average time needed to fill out the questionnaire was nearly 30 minutes.

**Data Management**: Before the data entry and analysis, it had been cleaned and coded. Ensure that the data does not contain errors, inconsistency, omissions, or incongruous data. Researchers checked all forms for missing entries, faulty skip patterns, and incomplete or unclear answers. Participants were asked to clarify their answers when needed. Each checked questionnaire form had assigned an identifying

**Table 1** | Demographic and Occupational features of the sample .

| Socio-demographic Characteristics | | No | % |
|---|---|---|---|
| **Age (years)** | | | |
| | <30 | 38 | 3.8 |
| | 30-34 | 587 | 58.7 |
| | 35-39 | 186 | 18.6 |
| | 40-44 | 70 | 7.0 |
| | 45-49 | 46 | 4.6 |
| | ≥50y | 73 | 7.3 |
| **Department and/ or speciality** | | | |
| | Internal Medicine | 194 | 19.4 |
| | Surgery | 275 | 27.5 |
| | Paediatric | 94 | 9.4 |
| | Gynaecology & obstetrics | 111 | 11.1 |
| | Ophthalmology | 27 | 2.7 |
| | Dermatology | 92 | 9.2 |
| | ENT | 65 | 6.5 |
| **Educational level** | | | |
| | Bachelor | 439 | 43.9 |
| | Diploma | 52 | 5.2 |
| | Master | 19 | 1.9 |
| | Board and/or PhD | 490 | 49.0 |
| **Job Title** | | | |
| | Resident | 46 | 4.6 |
| | Board student | 694 | 69.4 |
| | Specialist | 189 | 18.9 |
| | Consultant | 71 | 7.1 |
| **Job duration (years)** | | | |
| | <5 | 122 | 12.2 |
| | 5-9 | 556 | 55.6 |
| | 10-14 | 183 | 18.3 |
| | 15-19 | 65 | 6.5 |
| | ≥20- | 74 | 7.4 |
| **Workdays/week** | | | |
| | ≤3 | 19 | 1.9 |
| | 4 | 106 | 10.6 |
| | ≥5 | 875 | 87.5 |
| **The average number of patients seen /day** | | | |
| | ≤19 | 129 | 12.9 |
| | 20-29 | 169 | 16.9 |
| | 30-39 | 216 | 21.6 |
| | 40-49 | 118 | 11.8 |
| | ≥50 | 368 | 36.8 |

serial number and was kept in a secured place.

**Data entry**: the checked questionnaire forms were entered into a computer-supported database and statistical software programs using database management analysis software and spreadsheet applications (Excel).[18] The data extracted from the summed questionnaires had been collected, collated, coded and entered into tabulated excel sheets before exporting them to the SPSS.

**Table 2** | knowledge, attitude and practice score of the sample.

| KAP score | Mean ±SD | | No. | % |
|---|---|---|---|---|
| **Knowledge score †** | 4.82±1.48 | Acceptable | 128 | 12.8 |
| | | Unacceptable | 872 | 87.2 |
| **Attitude score ‡** | 26.86±3.76 | Negative | 220 | 22.0 |
| | | Positive | 780 | 78.0 |
| **Practice score §** | 23.30±2.16 | Poor | 570 | 57.0 |
| | | Good | 430 | 43.0 |

† Knowledge score ≥ 7 is acceptable, <7 unacceptable.
‡ Attitude ≥ 18 is positive, < 18 is negative.
§ Practice score ≥ 18 is good, < 18 is poor.

**Statistical analysis**: Data analysis had carried out using the available statistical package of SPSS-25 (Statistical Packages for Social Sciences - version 25). Categorical variables were presented in simple frequency, percentages, and proportions. At the same time, continuous variables were shown in the mean ± standard deviation and the range (minimum-maximum values). The Pearson chi-square test was used to test the association between the dependent variables (knowledge, attitude and practice) and the independent variables (medical doctors` socio-demographic). The Fisher-Exact test was used whenever applicable. A P-value equal to or less than 0.05 was considered statistically significant.[18,19]

## RESULTS

The response rate was 73.47 % ( 1000 out of 1361 distributed forms). The majority of the participants, 587 (58.7%), is in the age group of 30-34 years, 275 (27.5 %) are from the department of surgery, 694 (69.4 %) are senior house officers (board students). For other demographic and occupational features see table 1.

The mean of knowledge score of the participants was 4.82±1.48, in 872 participants (87.2 %) the score was unacceptable. The mean score of attitude was 26.86±3.76, positive in

**Table 3** | Association of some demographic and occupational features and the knowledge and attitude and practice scores.

| Demo-occupational features | Knowledge Score† | | | | P value | Attitude Score‡ | | | | P value | Practice Score § | | | | P value |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Acceptable | | Unacceptable | | | Positive | | Negative | | | Good | | Poor | | |
| | No. | % | No. | % | | No. | % | No. | % | | No. | % | No. | % | |
| **Age (years)** | | | | | **0.0001*** | | | | | **0.0001*** | | | | | **0.005*** |
| <30y | 3 | 7.9 | 35 | 92.1 | | 25 | 68.5 | 13 | 34.5 | | 9 | 23.5 | 29 | 76.5 | |
| 30-34 | 57 | 9.8 | 530 | 90.2 | | 425 | 72.5 | 162 | 27.5 | | 196 | 33.3 | 391 | 66.7 | |
| 35-39 | 22 | 11.8 | 164 | 88.2 | | 139 | 74.8 | 47 | 25.2 | | 83 | 44.5 | 103 | 55.5 | |
| 40-44 | 11 | 15.6 | 59 | 84.4 | | 61 | 87.2 | 9 | 12.8 | | 34 | 48.4 | 36 | 51.6 | |
| 45-49 | 9 | 19.5 | 37 | 80.5 | | 42 | 91.5 | 4 | 8.5 | | 24 | 52.1 | 22 | 47.9 | |
| ≥50y | 21 | 28.6 | 52 | 71.4 | | 69 | 94.6 | 4 | 5.4 | | 42 | 57.2 | 31 | 42.8 | |
| **Department and/or speciality** | | | | | **0.0001*** | | | | | **0.0001*** | | | | | **0.0001*** |
| Internal Medicine | 22 | 11.3 | 172 | 88.7 | | 165 | 85.1 | 29 | 14.9 | | 98 | 50.5 | 96 | 49.5 | |
| Surgery | 31 | 12.3 | 244 | 88.7 | | 229 | 83.2 | 4 | 16.8 | | 139 | 50.6 | 136 | 49.4 | |
| Paediatric | 11 | 11.2 | 83 | 88.2 | | 79 | 84.0 | 15 | 16.0 | | 51 | 54.3 | 43 | 45.7 | |
| Gynaecology & obstetrics | 17 | 15.2 | 94 | 84.8 | | 99 | 89.1 | 12 | 10.9 | | 57 | 51.4 | 54 | 48.6 | |
| Ophthalmology | 1 | 3.6 | 26 | 96.4 | | 19 | 70.3 | 8 | 29.7 | | 4 | 14.9 | 23 | 85.1 | |
| Dermatology | 7 | 7.6 | 85 | 92.4 | | 71 | 77.1 | 21 | 22.9 | | 42 | 45.6 | 50 | 54.4 | |
| ENT | 9 | 13.8 | 56 | 86.2 | | 53 | 81.5 | 12 | 18.5 | | 33 | 50.8 | 32 | 49.2 | |
| **Educational level** | | | | | **0.001*** | | | | | **0.0001*** | | | | | **0.001*** |
| Bachelor | 54 | 12.4 | 385 | 87.6 | | 313 | 71.2 | 126 | 28.8 | | 117 | 26.7 | 322 | 73.3 | |
| Diploma | 6 | 11.6 | 46 | 88.4 | | 38 | 73.1 | 14 | 26.9 | | 15 | 28.9 | 37 | 71.1 | |
| Master | 2 | 10.5 | 17 | 89.5 | | 15 | 78.8 | 4 | 21.2 | | 6 | 31.5 | 13 | 68.5 | |
| Board and/or PhD | 82 | 16.7 | 408 | 83.3 | | 448 | 91.3 | 42 | 8.7 | | 189 | 38.6 | 302 | 61.4 | |
| **Job title** | | | | | **0.570** | | | | | **0.0001*** | | | | | **0.0001*** |
| Resident | 4 | 8.7 | 42 | 91.3 | | 31 | 67.4 | 15 | 32.6 | | 8 | 17.3 | 38 | 82.7 | |
| Board student | 90 | 13.0 | 604 | 87.0 | | 531 | 76.6 | 163 | 23.4 | | 206 | 29.3 | 488 | 70.7 | |
| Specialist | 22 | 11.6 | 167 | 88.4 | | 154 | 81.5 | 35 | 18.5 | | 71 | 37.4 | 118 | 62.6 | |
| Consultant | 12 | 16.9 | 59 | 83.1 | | 59 | 83.3 | 12 | 16.7 | | 32 | 45.1 | 39 | 54.9 | |
| **Job duration (years)** | | | | | **0.002*** | | | | | **0.0001*** | | | | | **0.0001*** |
| <5y | 12 | 9.8 | 110 | 90.2 | | 86 | 70.5 | 36 | 29.5 | | 19 | 15.6 | 103 | 84.4 | |
| 5-9 | 65 | 11.7 | 486 | 87.4 | | 421 | 75.8 | 135 | 24.2 | | 209 | 37.5 | 347 | 62.5 | |
| 10-14 | 29 | 15.9 | 150 | 83.1 | | 144 | 78.7 | 39 | 21.3 | | 81 | 44.1 | 102 | 55.9 | |
| 15-19 | 12 | 18.6 | 53 | 71.6 | | 53 | 81.6 | 12 | 18.4 | | 32 | 49.2 | 33 | 50.8 | |
| ≥20y | 15 | 20.4 | 59 | 79.7 | | 64 | 86.5 | 10 | 13.5 | | 38 | 51.3 | 36 | 48.7 | |
| **Workdays/week** | | | | | **0.0001*** | | | | | **0.0001*** | | | | | **0.0001*** |
| ≤3 | 8 | 42.1 | 11 | 57.9 | | 17 | 89.5 | 2 | 10.5 | | 13 | 68.4 | 4 | 21.1 | |
| 4 | 15 | 14.2 | 91 | 85.8 | | 89 | 83.9 | 17 | 16.1 | | 68 | 64.2 | 49 | 46.3 | |
| ≥5 | 105 | 11.9 | 770 | 88.1 | | 687 | 78.6 | 188 | 21.4 | | 315 | 33.9 | 560 | 64.1 | |
| **Average number of patients seen /day** | | | | | **0.0001*** | | | | | **0.0001*** | | | | | **0.006*** |
| ≤19 | 24 | 19.3 | 105 | 81.7 | | 113 | 87.3 | 16 | 12.6 | | 69 | 53.4 | 60 | 46.6 | |
| 20-29 | 33 | 19.6 | 136 | 80.4 | | 148 | 87.4 | 23 | 13.7 | | 88 | 52.1 | 81 | 47.9 | |
| 30-39 | 34 | 15.7 | 182 | 88.3 | | 182 | 85.2 | 34 | 15.8 | | 8 5 | 39.3 | 131 | 60.7 | |
| 40-49 | 14 | 11.9 | 104 | 88.1 | | 79 | 66.9 | 35 | 29.7 | | 42 | 35.7 | 76 | 64.3 | |
| ≥50 | 38 | 10.4 | 330 | 89.6 | | 234 | 63.5 | 124 | 33.8 | | 123 | 33.4 | 245 | 66.6 | |

† Knowledge score ≥ 7 is acceptable, <7 unacceptable.
‡ Attitude ≥ 18 is positive, < 18 is negative.
§ Practice score ≥ 18 is good, < 18 is poor.
* P value ≤ 0.05 means statistically significant.

220 (22.0%). The mean score of the practice was 23.30±2.16, good practise was reported in 430 (43.0%). See table 2

Age, speciality, educational level, job duration, workdays per a week, and average number of patients seen per a day have shown statistically significant association with the knowledge score, acceptable or unacceptable, while occupational level has no statistical significance. All the socio-professional features studied have shown statistically association with the attitude score, positive or negative, and practice score, good or bad. For further details see table 3.

## DISCUSSION

**Sociodemographic and occupational characteristics**: participants' socio-demographic and occupational characteristics had a bold and apparent effect on their KAP scores. The research results showed that the Medical doctors` KAP scores were high when their experience had accumulated and increased with their age. So, experience is an important factor in determining the association with their KAP scores. On the other hand, their postgraduate specialisation training provide them with a good scientific background.

We found that speciality had significantly affected knowledge, attitude, and practice towards using antibiotics; gynaecologists and ENTists had the highest percentage of knowledge and attitude scores, while paediatricians had a good practice. It is not clear why having good knowledge, and attitude toward antibiotic use for gynaecologists and ENTists had not been reflected positively in practice. However, having good practice in using antibiotics by paediatricians may be attributed to the need to meticulously calculate the dosage of drugs in children according to their body weight and or surface areas to prevent adverse events.

We found a statistically significant association between having higher certificates like fellowships of Iraqi and Arabic Councils and/or PhD and get high scores of knowledge, attitude and practice towards using antibiotics. Such association is a marker that having a higher academic certificate will improve not only the knowledge but also the attitude and practice.

In our data, the KAP score has a statistically significant association with seniority, duration of work experience in years, and the number of working days per week; it is highest among specialists and consultants, those working for more than 20 years, and those working three and fewer days per week. Experience is expected to increase with years of work and more seniority. The reverse association between the KAP score and the number of working days a week might be explained by overloading doctors with work. It would leave limited time for reading and updating knowledge and preclude them from proper health care practice. Quality of work may be affected negatively when workdays exceed that recommended by the European Working Time Directive (EWTD),[20] Accreditation Council for Graduate Medical Education (ACGME)[21] and Institution of Medicine (IOM)[22] in the United States of America.

We also found that the KAP scores showed a statistically significant association with the average number of patients seen by the participants per day. Performance improves with more work until a limit, after which the performer would suffer mental and physical burdens leading to burnout and medical malpractice.[23]

**Knowledge**: In most of our participants, the knowledge score was unacceptable, similar to that observed by Thriemer in Congo in 2013.[24] A Malaysian study[25] conducted by Wei Leong and colleagues on medical doctors in 2015 has found different results than ours. The differences among these studies may be due to sampling size, types of questions, and selection criteria; some studies included medical students, pharmacists, and nurses, while we included only medical doctors.

Knowledge score in our study was significantly associated with many socio-demographic features of the participants. In contrast, the Malaysian study finds that neither the level of seniority nor the number of years in work has a

statistically significant association with knowledge score.[25] Similarly, a study conducted by Pulcini and colleagues[26] in 2011 and another one conducted by Arjun and colleagues[27] in India in 2004 have concluded that training years of experience do not significantly affect the knowledge about antibiotic resistance. The controversy of these results indicates that a longer duration of practice does not ensure good knowledge of antibiotic prescription. Thus, appropriate training and knowledge update of all healthcare providers, irrespective of their seniority, is required.

Most of our participants perceive antibiotic resistance as a local problem, instead of being national or international. In contrast, Wei Leong and colleagues in 2015 found that 56.0% and 27.0% of the respondents strongly agreed that ABR is a global and national problem, respectively, while 9.0 % strongly agreed that ABR is a problem in their daily practice.[25] Similarly, Waseem and colleagues in Pakistan 2019 stated that most medical doctors (83.1%) were found to be well aware of the global threat of ABR but agreed that ABR guidelines designed locally would be more beneficial than the international ones.[28] Different backgrounds of the participants of the different studies, the use of the multiple-choice format in designing questions, and limited access to the data in the local practice might be the reasons behind these differences. As observed in other studies, it is advisable to encourage more data dissemination on local ABR to the prescribers.[29]

**Attitude**: Patient expectations, unawareness of the ABR problem, and underestimation of the serious effects of (ABR) were the most critical factors associated with inappropriate use of antibiotics among prescribers.[30] Enhancing the prudent use of antibiotics and attaining substantial improvements in antibiotic use requires a complete understanding of medical doctors' attitudes to antibiotic prescription and assessing their knowledge about the growing problem of ABR.[31]

In our research, nearly half of the participants answered "neutral" to attitude questions, and 42.1% of them agreed that they would not prescribe antibiotics according to patients' demands. García et al. study in 2011 observed that three-quarters of participants identified patient demand for antibiotics as a key factor contributing to their overuse in the community, with half doing so in the hospital setting.[29]

Resistance to antibiotics is a public health threat, and many studies confirmed the relationship between antibiotic use and its resistance rate. Medical doctors represent a large proportion of the healthcare providers to prescribe antibiotics; therefore, knowing their attitude will enable health authorities to design interventions that improve antibiotic use and reduce resistance.[27,32]

**Practice**: More than half of the participants in our study have poor practice regarding the prescription of antibiotics, and 18 % prescribed antibiotics according to the institutional-specific guidelines, educational programs and regular microbiology surveillance more than international guidelines. At the same time, the highest proportion agreed that the "Majority of patients admitted to the institution would be prescribed at least one Antibiotic during their hospital stay". On the contrary, Wei Leong has found that the internet was the most resource of information because the doctors prefer international antibiotic guidelines over local ones;[27] they believe that local guidelines are useless, mythical, and non-applicable. Authorities should consider putting updated, easily applicable guidelines locally to help healthcare providers in their daily practice. In our study, we found that the quality of practice regarding antibiotics has a statistically significant association with some socio-demographic features of the participants. Wei Leong study in 2015 has stated a significant association between the frequency of antibiotic prescription and the seniority, of junior or senior medical doctors, and the awareness of ABR in their daily practice.[25] In the present research, about 20% of the participants mentioned that the unavailability of certain antibiotics in the hospital is the main reason for their inappropriate prescription. This result differs from that observed by Wei Leong, where more than half of the participants agreed that the choice of antibiotics was not affected by their availability in their

setting.[25] The different backgrounds of medical practitioners in each study could be attributed to a disagreement between the level of knowledge and practice.

## CONCLUSION

Knowledge about antibiotic resistance among Iraqi doctors working in the main hospitals in Baghdad was unacceptable, and most of them do not recognise the factors causing the resistance. Although the attitude towards antibiotic resistance was positive, the practice was poor in the majority.

## REFERENCES


1. National Health Service. "Antibiotics". NHS. Available at: https://www.nhs.uk/conditions/antibiotics/. accessed in August 2017
2. WHO. UK antibiotic consumption is twice that of the Netherlands, the World Health Organization report finds. Pharmaceutical Journal. 14 November 2018. Last updated 12 February 2021. Online: DOI:10.1211/PJ.2018.20205732. Available from: https://www.pharmaceutical-journal.com/news-and-analysis/news-in-brief/uk-antibiotic-consumption-twice-that-of-the-netherlands-who-report-finds/20205732. Article accessed on May 2021
3. Al-Jumailia AA, Husseinb AH, Al-Rekabib MD, Raheemc SA, Ernst EJ. Antimicrobial utilisation in an Iraqi province: a comprehensive evaluation of antibiotic source and cost. *International Journal of Pharmacy Practice* 2017 Feb; 25(1):81-88. Doi: 10.1111/ijpp.12338. Available from: https://www.ncbi.nlm.nih.gov/pubmed/28097722. Accessed in November 2017.
4. Larson E. "Community factors in the development of antibiotic resistance". *Annual Review of Public Health* 2007.28:435-447. Available from: https://doi.org/10.1146/annurev.publhealth.28.021406.144020. Accessed in August 2017
5. Ong S, Nakase J, Moran GJ, Karras DJ, Kuehnert MJ, Talan DA. "Antibiotic use for emergency department patients with upper respiratory infections: prescribing practices, patient expectations, and patient satisfaction". *Annals of Emergency Medicine*. 50 (3): 213–20. Available from: https://www.ncbi.nlm.nih.gov/pubmed/17467120. Accessed in June 2017
6. Al-Saadi NT. The use and misuse of antibiotics as self-medication by people in Al-Samawa city. *World Journal of Pharmacy and Pharmaceuticals Sciences* 2015;5(2):98-108. Available from: https://www.wjpps.com/Wjpps_controller/abstract_id/4501. Accessed in August 2017
7. Elabd FM, Al-Ayed MS, Asaad AM, Alsareii SA, Qureshi MA, Musa HA. Molecular characterization of oxacillinases among carbapenem-resistant Acinetobacter baumannii nosocomial isolates in a Saudi hospital. *J Infect Public Health*. 2015 May-Jun;8(3):242-7. doi: 10.1016/j.jiph.2014.10.002. Epub 2014 Nov 18. PMID: 25466594.
8. André M, Vernby A, Berg J, Lundborg CS. A survey of public knowledge and awareness related to antibiotic use and resistance in Sweden. *J Antimicrob Chemother*. 2010 Jun;65(6):1292-6. doi: 10.1093/jac/dkq104. Epub 2010 Apr 1. PMID: 20360063.
9. World Health Organization. Iraq develops a national action plan to address antimicrobial resistance. WHO 2017. Available from: http://www.emro.who.int/irq/iraq-news/moh-in-collaboration-with-who-develops-national-action-plan-tackling-antimicrobial-resistance-in-iraq.html. Accessed on 6 October 2020.
10. Abdul Kareem RA, Omer QBA, Haji SD, Zozankh E, Rasheed NM. Errors and Omissions in Private Clinics Prescriptions: A Survey of Prescription Writing in Duhok, Kurdistan Region-Iraq. *J Pharmaco-vigilance* 2016;4(4): 215. Doi:10.4172/2329-6887.1000215.
11. Kheder S I. Physicians' Knowledge and Perception of Antimicrobial Resistance: A Survey in Khartoum State Hospital Settings. *Journal of Pharmaceutical Research International*, 2013;3(3):347-362. Doi: 10.9734/BJPR/2013/2117.
12. Baadani AM, Baig K, Alfahad WA, Aldalbahi S, Omrani AS. Physicians' knowledge, perceptions, and attitudes toward antimicrobial prescribing in Riyadh, Saudi Arabia. *Saudi Medical Journal* 2015;36(5):613-619. doi: 10.15537/smj.2015.5.11726.
13. Tan WL, Siti R, Shahfini I, Zuraidah A. Knowledge, attitude and practice of antibiotics prescribing among medical officers of public health care facilities in the state of Kedah, Malaysia. *Med J Malaysia* 2015;70(5):307-311.
14. Taylor-Powell E, Hermann K. Collecting Evaluation Data: Surveys. Program Development and Evaluation, University of Wisconsin-Extension, Cooperative Extension. 10-08. Available from: http://www.it-docs.net/ddata/8546.pdf. Accessed in October 2019.
15. Shinde MR and Mohite VR. A Study to Assess Knowledge, Attitude, and Practices of Five Moments of Hand Hygiene among Nursing Staff and Students at a Tertiary Care Hospital at Karad. *International journal science and research* (IJSR), 2014:3(2):311-321. Available from: https://www.ijsr.net/archive/v3i2/MDIwMTM5NTc=.pdf.
16. Al Sunni A, Latif R. Perceived stress among medical students in preclinical years: A Saudi Arabian perspective. *Saudi J Health Sci* 2014;3:155-9. Available from: https://www.saudijhealthsci.org/text.asp?2014/3/3/155/142324.
17. El-Jardali F, Hemadeh R, Jaafar M, Saghearian L, El-Skaff R, Mdeihly R, Jamal D, and Ataya N. The impact of accreditation of primary healthcare centers: successes, challenges and policy implications as perceived by healthcare providers and directors in Lebanon. *BMC Health Serv Res*, 2014; 14, 86. https://doi.org/10.1186/1472-6963-14-86
18. Moore DS, McCabe GP, and Craig BA. Introduction to the Practice of Statistics; Sixth Edition. Betsy Greenberg University of Texas – Austin. W.H. Freeman and Company, New York. Available from: http://bcs.whfreeman.com/webpub/statistics/ips6e/manuals/student_excel_manual/ips6e.ex.st.pdf . Accessed in June 2019.
19. Daniel WW and Cross CL; Biostatistics: A Foundation for Analysis in the Health Sciences; 10th ed. John Wiley & Sons. Inc. USA, 2013. Available from: http://docshare02.docshare.tips/files/22448/224486444.pdf. Accessed in October 2019.
20. Ulmer C, Miller Wolman D, Johns MME. Resident Duty Hours: Enhancing Sleep, Supervision, and Safety. Institute of Medicine Committee on Optimizing Graduate Medical Trainee Hours and Work Schedule to Improve Patient Safety; Washington: National Academies Press; 2009. Summary. Available from: https://www.ncbi.nlm.nih.gov/books/NBK214956/?report=classic. Accessed in December 2019.
21. Pickersgill T. The European working time directive for doctors in training. *BMJ*. 2001;323(7324):1266. doi:10.1136/bmj.323.7324.1266. Available from: https://www.ncbi.nlm.nih.gov/

pmc/articles/PMC1121739/. Accessed in December 2019.

22. Nasca TJ, Day SH, Amis ES Jr; ACGME Duty Hour Task Force. The new recommendations on duty hours from the ACGME Task Force. *N Engl J Med.* 2010 Jul 8;363(2):e3. doi: 10.1056/NEJMsb1005800. Epub 2010 Jun 23. PMID: 20573917. Accessed in December 2019.
23. John Elflein Number of patients that doctor in the US. Saw per day from 2012 to 2018. US physicians number of patients per day. Statista.com. Available from: https://www.statista.com/statistics/613959/us-physicans-patients-seen-per-day/. Accessed in December 2019.
24. Thriemer K, Katuala Y, Batoko B, Alworonga JP, Devlieger H, Van Geet C, et al. Antibiotic prescribing in DR Congo: a knowledge, attitude, and practice survey among medical doctors and students. *PloS One*. 2013; 8(2): e55495. Available from: https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0055495. Accessed in July 2020.
25. Tan WL, Siti R, Shahfini I, Zuraidah A. Knowledge, attitude and practice of antibiotics prescribing among medical officers of public health care facilities in the state of Kedah, Malaysia. *Med J Malaysia* 2015; 70(5):307-311. Available from: https://europepmc.org/article/med/26556121. Accessed in August 2019.
26. Pulcini C, Williams F, Molinari N, Davey P, Nathwani DJCm, infection. Junior doctors' knowledge and perceptions of antibiotic resistance and prescribing: a survey in France and Scotland. *Clinical Microbiology and Infection* 2011;17(1):80-7. Available from: https://www.ncbi.nlm.nih.gov/pubmed/2013225.
27. Arjun S, Xiaoyan S, Ann R. A survey of knowledge, attitudes, and beliefs of house staff physicians from various specialities concerning antimicrobial use and resistance. *Arch. International Med* 2004; 164:1451-1456. Available from: https://www.ncbi.nlm.nih.gov/pubmed/15249355.
28. Waseem H, Ali J, Sarwar F, Khan A, Ur Rehman HS, Choudri M, et al. Assessment of knowledge and attitude trends towards antimicrobial resistance (AMR) among the community members, pharmacists /pharmacy owners, and physicians in district Sialkot, Pakistan. 2019. *Antimicrobial Resistance & Infection Control* 2019;8(1):67. Available from: https://aricjournal.biomedcentral.com/articles/10.1186/s13756-019-0517-3. Accessed in November 2019.
29. García C, Llamocca LP, García K, Jiménez A, Samalvides F, Gotuzzo E, Jacobs J. Knowledge, attitudes and practice survey about antimicrobial resistance and prescribing among physicians in a hospital setting in Lima, Peru. *BMC Clin Pharmacol*. 2011 Nov 15;11:18. doi: 10.1186/1472-6904-11-18. PMID: 22085536; PMCID: PMC3231801.
30. Costelloe C, Metcalfe C, Lovering A, Mant D, Hay AD. Effect of antibiotic prescribing in primary care on antimicrobial resistance in individual patients: systematic review and meta-analysis. *BMJ* 2010; 340:c2096. Available from: https://www.ncbi.nlm.nih.gov/pubmed/20483949. Accessed in October 2020.
31. Charani E, Edwards R, Sevdalis N, Alexandrou B, Sibley E, Mullett D, Franklin BD, Holmes A. Behavior change strategies to influence antimicrobial prescribing in acute care: a systematic review. *Clin Infect Dis*. 2011 Oct;53(7):651-62. doi: 10.1093/cid/cir445. PMID: 21890770.
32. Vazquez-Lago JM, Lopez-Vazquez P, Lopez-Duran A, Taracido-Trunk M, Figueiras A. Attitudes of primary care physicians to the prescribing of antibiotics and antimicrobial resistance: a qualitative study from Spain. *Family practice*. 2012. 29(3):352-60. Available from: https://pubmed.ncbi.nlm.nih.gov/22016323/. Accessed in December 2019.

**Abbreviations list**: Accreditation Council for Graduate Medical Education (**ACGME**), Antimicrobial resistance (**ABR**), Continuous medical education (**CME**), European Working Time Directive (**EWTD**), Institution of Medicine (**IOM**), Knowledge, attitude, and practice (**KAP**), Statistical Packages for Social Sciences - version 25 (**SPSS-25**), World Health Organization (**WHO**).

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