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KNOWLEDGE AND PRESCRIBING PRACTICE OF PHYSICIANS TOWARD ANTIMICROBIAL RESISTANCE IN HEALTHCARE SETTING, DIYALA, IRAQ

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ABSTRACT

Background: Antimicrobial resistance has increasingly become one of the most critical public health issue. The prescribing behavior of physicians plays a key role in controlling and reduction of antimicrobial resistance. **Aims of the study:** We aimed to assess knowledge and prescribing practice of physicians at our healthcare settings. **Methods:** A cross sectional study was conducted in Baquba teaching hospital and Al-Batool teaching hospital for Maternity and Pediatrics in Diyala province, Iraq, during the period from 1st October 2017 to 1st February 2018. Self-administrated questionnaire were used to assess knowledge and prescribing practice of our physicians. **Results:** A total of 117 physicians agreed to participate in the current study with a response rate of (95.1%). The college curricula was significantly the major source of information (37.7%), while WHO and MOH guidelines were the least, (3.5%) and (0.9%), respectively. According to Bloom's Cut Off Point the respondents have good to moderate level of knowledge about most of quiz questions. Since, the ratios of correct answers were high generally. About one half of respondents were aware about antimicrobial resistance as a global problem and also in our setting, 56 (49.1%) and 55(48.2%), respectively. Regarding factors behind antibiotic resistance, 68 (59.6%) of the respondents were suggest multifactorial causes. However, self-prescription ranked highest with 19(16.7%) followed by treatment discontinuation 18(15.8%) as the major causes. Honestly and precisely, 48 (42.1%) of the respondents negate fulfillment of the disinfection program. Again, about one half 68 (59.6%) of the respondents acknowledged the necessity of culture and antibiotic susceptibility test if bacterial pathogen suspected. However, only 33(28.9%) do it frequently. **Conclusion:** creation of innovative strategies to attract physicians' attention about antimicrobial resistance prevention.

KEYWORDS: Antimicrobial resistance, Antibiotic Prescription, Knowledge, prescribing practice.

INTRODUCTION

Antimicrobial resistance has increasingly become one of the most critical public health issue, not only for causing increased morbidity and mortality but also a high economic burden especially in low income countries which are already underfunded with weak institutional structures.[1,2]

Several pathogens have developed resistance or multiple resistances to key antimicrobials, including vancomycin-resistant enterococci, extended-spectrum β- lactamases-producing *E. coli*, methicillin-resistant *Staphylococcus aureus* (MRSA), and, most recently, vancomycin-resistant *S. aureus.*[3,4]

Several years ago, concern focused on Gram-positive bacteria such as MRSA and Vancomycin-resistant enterococci. Now clinical microbiologists suppose that gram negative bacteria bear the greatest risk to the public health not only because of overcoming resistance of gram positive bacteria so rapidly but also there are fewer new antibiotics active against G-negative bacteria.[5]

Bacteria may acquire antibiotic resistance either by acquisition of already-made resistance genes from other microorganisms through horizontal transfer or by mutation in different chromosomal loci. Although it has been reported that, because of the low frequency at which mutations occur, resistance in natural environments is mainly acquired through horizontal transfer, a number of mechanisms of antibiotic resistance are based on mutational events.[6]

Under stressful conditions, such as antibiotic challenge, selective pressure favors mutator strains of bacteria over nonmutator strains, leading to the selection and spread of resistant bacteria.[7]

The major factors that drive antimicrobial resistance in low income countries are overuse and misuse of antimicrobials, incomplete treatments and self-

medication as well as insufficient compliance with infection control precautions.[1,8]

Nationally, antimicrobial use was demonstrated as potentially unnecessary or inappropriate in several studies.[9,10] And that decreasing overuse is the cornerstone in curb antimicrobial resistance through changes in prescribing behavior.

To best of our knowledge there is no study measured the physician's attitude and behavior toward antimicrobial resistance in Iraq, so we aimed to assess knowledge, attitudes prescribing practice of physicians at our healthcare settings.

SUBJECTS AND METHODS

A cross sectional study was conducted in Baquba teaching hospital and Al-Batool teaching hospital for Maternity and Pediatrics in Diyala province, Iraq, during the period from 1st October 2017 to 1st February 2018. One hundred and twenty-three physicians were invited to participate in this study and a verbal consent from one hundred and seventeen respondents was obtained to be enrolled in this study. The questionnaire was developed according to previous studies.[11,12]

The first part of the questionnaire highlighted demographic information of respondents such as age, sex, professional status, specialty and number of years of clinical experience. The second part focused on the physicians' opinions regarding antibiotic resistance and their awareness of the magnitude of this problem, in addition to simple cases to evaluate knowledge of the doctors about antimicrobial usage and prescription including: 3 case-based question, and questions about the safest antibiotic during pregnancy, ability of antimicrobial agents to cross blood brain barrier, timing of prophylactic antibiotic and what alarming about MRSA. Third part includes questions about prescribing practice of antimicrobial agents.

The knowledge of the respondents was assessed by using Bloom's Cut Off Point, where a score of 80-100% of correct answers meant a good knowledge, a score of 60-79% moderate knowledge and a poor knowledge for less than 60% score. The attitude part used 5-point Liker response options from "overmuch" to "not at all", then recoded into positive response (overmuch, yes, somewhat) or negative response (no, not at all).

Statistical analysis

Data of current study were analysed by using chi-square (X^2) to compared between percentages. A level of significance of α=0.05 was applied to test. (SPSS v.21 and Excel 2013) program used to analyse current data.

RESULTS

A total of 117 physicians agreed to participate in the current study with a response rate of (95.1%). Of these, 3 were discarded due to incomplete information.

The result of the current study revealed that most of the respondents 74 (64.9%) were from age group 25-34 year, while 23 (20.2%) and 17 (14.9%) were between 35-44 year and 45-54 year, respectively. In relate to gender, the proportion of both male and female was 5o%. While in relate to profession, 41 (36%) of the respondents were senior resident followed by 38 (33.3%) were intern, 29 (25.4%) were resident and 6 (5.3%) were consultant. Of the respondents 34 (29.8%) were belonging to both internal medicine and surgery departments, while the rest were belonging to Obstetrics & Gynecology and pediatric in rates of 24 (21.1%) and 22 (19.3%), respectively. More than half of the respondents 59 (51%) had less than 5 years of experience of working, table (1).

Table (1): The demographic description of participant.

Variable	No.	%
Age		
25-34	74	64.9%
35-44	23	20.2%
45-54	17	14.9%
Gender		
Male	57	50.0%
Female	57	50.0%
Profession		
Intern	38	33.3%
Resident	29	25.4%
Senior resident	41	36.0%
Consultant	6	5.3%
Specialty		
Medicine	34	29.8%
Surgery	34	29.8%
Obstetrics & Gynecology	24	21.1%
Pediatrics	22	19.3%
Experience		
<5 years	59	51.8%
5-10 years	18	15.8%
>10 years	37	32.5%

Regarding the source of scientific information, the results found that the college curricula was a significantly major source (χ^2 =124.4, P= 0.001) followed by multiple sources. Surprisingly, MOH guidelines were the least source of information (0.9%), table (2).

Table (2): Source of scientific information about antimicrobial agents.

Parameters	Value	Count	Percent	X^2	df	Sig.
Sources of your information	pharmaceutical companies	9	7.9%	124.491	6	0.001*
	senior staff	13	11.4%			
	college courses	43	37.7%			
	Internet	2	1.8%			
	WHO guidelines	4	3.5%			
	MOH guidelines	1	.9%			
	more than one source	42	36.8%			

Whether the antimicrobial resistance is a global problem or not, about one half 56 (49.1%) of respondents were agree that is actually so. The difference compared to other options was statistically significant (χ^2 =84.8, P= 0.001). This is followed by those respondents who believe that antimicrobial resistance is considered as a global problem to somewhat 31(27.2%).

So, what is the situation in our healthcare settings, again about one half 55(48.2%) of respondents were agree that is a problem. The difference was statistically significant (χ^2 =81.4, P= 0.001). Amazingly, very close percentage of participants (23.7% and 22.8%) were reported an opposite outcomes (overmuch *vs* somewhat) respectively.

Thereafter, regarding contributing factors to the antibiotic resistance the respondents were failed to aggregate around one reason, so their answers were widely dispersed. However, more than one half of them 68 (59.6%) were suggest multifactorial causes. So the difference was statistically significant (χ^2 =167.5, P= 0.001).

About the application of nosocomial disinfection program in our hospital, the majority of respondents 48 (42.1%) honestly and precisely negate fulfillment of the disinfection program. The difference was statistically significant (χ^2 =63.9, P= 0.001). On the other hand, about one fifth 25 (21.9%) of respondents were approved that is applied efficiently.

To assess their knowledge about the alarming feature of MRSA that it not present before, the answers of respondents regarding MRSA were again very scattered and they failed to have a common precise one. So the majority of them (43.0%) were beloved that is a community problem. The difference was statistically significant (χ^2 =23.7, P= 0.001), table (3).

Table (3): The response of respondent to questions about their knowledge of antimicrobial resistance.

Parameters	Value	Count	Percent	X^2	Df	Sig.
Antimicrobial Resistance Is a Problem globally	Overmuch	20	17.5%	84.860	4	0.001*
	Yes	56	49.1%			
	Somewhat	31	27.2%			
	No	6	5.3%			
	not at all	1	.9%			
Antimicrobial Resistance Is a Problem in our setting	Overmuch	27	23.7%	81.439	4	0.001*
	Yes	55	48.2%			
	Somewhat	26	22.8%			
	No	5	4.4%			
	not at all	1	.9%			
Which of these Contributing to Antimicrobial Resistance	Treatment discontinuation	18	15.8%	167.579	5	0.001*
	Low quality drug	6	5.3%			
	Too low dose at	2	1.8%			
	Self-prescription	19	16.7%			
	Use of antibiotics in animal breeding	1	.9%			
	All of these.	68	59.6%			
Is nosocomial disinfection program applied efficiently in our hospitals	Overmuch	2	1.8%	63.982	4	0.001*
	Yes	25	21.9%			
	Somewhat	33	28.9%			
	No	48	42.1%			
	not at all	6	5.3%			
what's alarming about MRSA that is not true before	nosocomial infection	30	26.3%	23.754	3	0.001*
	problem in community	49	43.0%			
	virulent type	20	17.5%			
	ineffective in penicillinase producing bacteria	15	13.2%			

Regarding the knowledge of respondents about antimicrobial prescription, the 4th case concerning safe antibiotic during pregnancy was the most one answered right by the respondents 104 (91.2%) while the 3rd case was the least one answered right 41 (36%). According to Bloom's Cut Off Point the respondents have good to moderate level of knowledge about most of quiz questions. The difference was statistically significant (χ^2 =226.9, P= 0.001), (χ^2 =136.9, P= 0.001), respectively. Generally, the ratios of correct answers were high in 1st (87%), 2nd (70%), 5th (79.8%), 6th (62.3%), and 7th (72.8%) cases also, table (4).

Table (4): The response of respondent to questions about their knowledge of antimicrobial prescription.

Parameters	Value	Count	Percent	X^2	df	Sig.
case 1	Ciprofloxacin	7	6.2%	327.842	4	0.001*
	TMP/SMX	7	6.2%			
	No antibiotic	100	87.7%			
case 2	Amoxicillin	80	70.2%	127.544	3	0.001*
	Clarithromycin	12	10.5%			
	TMP/SMX	4	3.5%			
	No need	18	15.8%			
case 3	Patient A	13	11.4%	57.930	3	0.001*
	Patient B	55	48.2%			
	both A & B	41	36.0%			
	neither A nor B	5	4.4%			
Which one of the following antibiotics is safe during pregnancy?	Amoxicillin	104	91.2%	266.982	3	0.001*
	Ciprofloxacin	5	4.4%			
	Gentamicin	5	4.4%			
Which one of the following antibiotics has the best activity against anaerobes?	Ciprofloxacin	13	11.4%	111.000	2	0.001*
	Metronidazole	91	79.8%			
	TMP-SMX	10	8.8%			
Methicillin-resistant Staphylococcus aureus is susceptible to:	Cefalotin	4	3.5%	90.281	3	0.001*
	Cefuroxime	18	15.8%			
	Ceftriaxone	21	18.4%			
	None	71	62.3%			
Which one of the following antibiotic most effectively crosses the blood-brain barrier?	Clindamycin	1	.9%	91.000	2	0.001*
	Ceftriaxone	30	26.3%			
	Vancomycin	83	72.8%			
which of the following situation should be the best time to give the patient antibiotic prophylaxis	after GI/GU surgery	62	54.4%	136.965	4	0.001*
	patient without known exposure	3	2.6%			
	before travelling to endemic area	43	37.7%			
	patient undergo non-invasive surgery	4	3.5%			
	patients who does not have cardiac valve disease	2	1.8%			

In relate to prescription practicing, the results showed that 68 (59.6%) of the respondents said yes when they had been asked whether culture and antibiotic susceptibility test is necessary if bacterial pathogen suspected. The difference compared to other options was statistically significant (χ^2 =141.6, P= 0.001). However, (46.5%) of the respondents admitted that they somewhat do culture and antibiotic susceptibility test for their patients with a significant difference compared to other options (χ^2 =71.7, P= 0.001), while only 33(28.9%) do it frequently.

In regard to use a broad spectrum antibiotics to ensure curing of the patient, about one half 64 (56.1%) of the respondent prefer this practice with a statistically significant difference (χ^2 =108.5, P= 0.001).

More than one half 68 (59.6%) of the respondent have already dealt with cases of antimicrobial resistance, however, 52(45.6%) of them confirmed successful treatment for resistance cases. The difference was statistically significant compared to other answers (χ^2 =94, P= 0.001), (table 5).

Table (5): The response of the physicians to question related to prescribing practice.

Parameters	Value	Count	Percent	X^2	Df	Sig.
Is culture and antibiotic susceptibility test is necessary if bacterial pathogen suspected	Overmuch	4	3.5%	141.614	4	0.001*
	Yes	68	59.6%			
	Somewhat	34	29.8%			
	No	4	3.5%			
	not at all	4	3.5%			
Do you do that for your patients	Obligatory	8	7.0%	71.702	4	0.001*
	Frequently	33	28.9%			
	Somewhat	53	46.5%			
	No	16	14.0%			
	not at all	4	3.5%			
When in doubt, it is better to ensure that a patient is cured of an infection by using a broad-spectrum antibiotic	Overmuch	8	7.0%	108.544	4	0.001*
	Yes	64	56.1%			
	Somewhat	28	24.6%			
	No	11	9.6%			
	not at all	3	2.6%			
do you deal with cases of antimicrobial resistance	Overmuch	7	6.1%	130.825	4	0.001*
	Yes	68	59.6%			
	Somewhat	29	25.4%			
	No	8	7.0%			
	not at all	2	1.8%			
are you success to treat them	Overmuch	9	7.9%	94.035	4	0.001*
	Yes	52	45.6%			
	Somewhat	43	37.7%			
	No	6	5.3%			
	not at all	3	2.6%			

DISCUSSION

There is a broad agreement that the growing problem of antimicrobial resistance is a great challenge to health care. Many previous studies have found that misuse of antibiotics was one of the major causes for increased problem of antimicrobial resistance.[1,10,12,13]

Examination of knowledge, attitudes, and beliefs of physicians can enhance the effectiveness of interventions to improve antimicrobial use and prevent resistance. Our study aimed to assess the knowledge and attitude of Iraqi physicians in selected hospitals of Diyala province towards antimicrobial resistance and their prescribing practice.

Regarding source of information the result showed that a college curriculum is the major source of information. This is probably because most of the respondents were young, and the information received from the college courses is still fresh. Our results were inconsistent with Garcia *et al.*[15] in which advice from colleagues is the most useful source. Surprisingly, MOH and WHO guidelines were the least source of information this may be due to the fact that these sources are unreliable or scarce and in both cases are considered to be major drawbacks of health care provider. This is similar to what was shown in the study done by Eltwansy and Salem.[14]

Whether the antimicrobial resistance is a problem or not, the majority of respondents aware that antibiotic resistance is a global problem and that is in fact the situation in our settings. These findings are in tune with studies from other settings.[15,16,17]

About the real cause behind antimicrobial resistance in our settings, self-prescription and treatment discontinuation were believed to be important general causes of resistance. That confirmed observations by other studies.[16,18] On the other hand, more than one half of respondents (59.6%) were preferred the most academic answer (all of these).

In terms of effectiveness of nosocomial disinfection program, the majority of respondents (42.1%) honestly and precisely said "NO". Although many previous studies have shown that inadequate hand washing hygiene is the most infection control program, yet laxity is noted in its application.[19,20]

Although many recent studies in our hospitals has shown moderate prevalence levels of MRSA.[21,22] More than a half of the respondent failed to have a common precise one. The reason may be that the do not know what is being published.

Generally our results found that according to Bloom's Cut Off Point the respondents have good to moderate level of knowledge about most of quiz questions. However, in some aspects like antibiotic dose reduction in renal failure and the best time to give antibiotic prophylaxis, their answers showed lack in awareness.

About the necessity of culture and antibiotic susceptibility test and if they doing it to their patient; the majority recognize the importance of culture and antibiotic susceptibility test, but (46.5%) of them said that they do it somewhat. Interestingly, it showed an apparent discrepancy in their estimation. It is possible that respondents might give socially desirable answers, rather than their true opinions or practices. As most of them preferred to use a broad spectrum antibiotic to ensure the patient cure of infection.

However, more than a half of the respondents indicated that they had already dealt with cases of antimicrobial resistance, but only small percentage of them failed to treat them. This may indicate that personal experience with antibiotic resistance was the most likely reason for awareness.

CONCLUSION

Although physicians were aware of the antibiotic resistance, there is conflicting view of their prescribing practice. So, nationwide studies are required to identify the pattern of antibiotic prescribing. Further education activities about antimicrobial therapy and creation of innovative strategies about antimicrobial resistance prevention are required.

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