ORIGINAL ARTICLE

Practices, knowledge, and attitude toward dispensing antibiotics without a prescription in Iraqi pharmacies

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ABSTRACT

Dispensing antibiotics without a prescription (DAWRx) is a potential threat to global public health and can lead to antimicrobial abuse and resistance development. Further research is required to examine the characteristics of DAWRx practice in Iraq. This study aimed to investigate the practices of DAWRx in Iraqi community pharmacies. A semi-structured, validated, pilot-tested online questionnaire was used to conduct a descriptive cross-sectional study in March 2020 among the members of the Iraqi Pharmacist Syndicate. The questionnaire contained five sections: demographics, antibiotic dispensing knowledge, and the prevalence, sources, and characteristic features of DAWRx practices. The results are presented using descriptive statistics and significant associations were reported. A total of 403 respondents completed the questionnaire and, of them, 363 were analyzed. Despite having a satisfactory knowledge of dispensing (64.7%), the practice of DAWRx was prevalent (98.3%). DAWRx was reported based on the pharmacies' recommendation (30.58%) and patients' request for antibiotics. Adults and pediatric patients received antibiotics from pharmacies for various conditions. Injectable antibiotics were also dispensed without a prescription (mainly ceftriaxone, n = 51/72). Moreover, the prevalence and the daily number of antibiotics dispensed were significantly associated with sex, pharmacy attitude toward DAWRx, and DAWRx upon patients' request. A significant association was noted between the knowledge of dispensing inquiries and the prevalence of and attitude toward DAWRx ($p < 0.05$). Impactful intervention strategies based on patterns identified in this study should be developed to improve antibiotic dispensing in community pharmacies and safeguard public health from the adverse effects of antimicrobial resistance.

Key words:
antibiotic; dispensing; community pharmacy

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INTRODUCTION

Dispensing antibiotics without a prescription (DAWRx) is a potential threat to public health globally and can lead to antimicrobial abuse and antimicrobial resistance (AMR) development [1]. An Emerging Infections Network survey indicated that 63% of their 1356 members recruited from three regions tended to a patient who developed an infection that was resistant to all available antibiotics and that the number of such resistant infections is increasing[2]. Moreover, the development of new antibiotics has been declining because of regulatory restrictions on new antibiotics; this often results in a lack of financial incentives for pharmaceutical companies to invest in new antibiotic discovery [3].

Despite being prescription-only medications, more than 50% of antibiotics are estimated to be sold by pharmacies worldwide without a prescription [4]. In Jordanian, Yemeni, and Syrian studies, more than 73% of participating pharmacists reported DAWRx [5–7]. A similar pattern of antibiotic dispensing was noted in studies conducted in Spain, Greece, Brazil, and Mexico [8–10]. The availability, accessibility, and affordability of antibiotics in community pharmacies facilitate the acquisition of antibiotics. Furthermore, fragile enforcement of antibiotic regulations aggravates the situation of antibiotic dispensing [11,12].

Health-care institutions in Iraq are financed by either the government or the private (out-of-pocket payments) sector. In the private sector, a registered pharmacist with a license from the Iraqi Pharmacist Syndicate (IPS, the legislative and regulatory authority of pharmacies in Iraq) is in charge of managing a community pharmacy, where prescribed and over-the-counter medications are dispensed [13]. Several studies demonstrated that antibiotics without a prescription (AWRx) were commonly dispensed from community pharmacies in Baghdad province [14–16] and highlighted the need for further research to identify factors associated with the practice of DAWRx in Iraq. This study investigated the practice of DAWRx in Iraqi pharmacies and the knowledge and attitudes of registered pharmacists and pharmacist assistants toward antibiotic dispensing.

METHODS

Study design, sample, and data collection

This descriptive cross-sectional study was conducted using the convenience sampling technique and a semi-structured anonymous questionnaire that was electronically distributed in closed social media groups affiliated with the IPS (where membership is restricted to only registered pharmacists and pharmacist assistants).

The online distribution mode was selected to determine the dispensing properties of pharmacies to prevent the effect of any reporting-influencing factor. This approach reduced the likelihood of social desirability bias that may be associated with the use of the self-administered questionnaire.

This study obtained approval from the IPS for posting the questionnaire and administering it to registered pharmacists and pharmacist assistants from different provinces in Iraq (18 regions of the country, each with a local government). This study was approved by the Human Research Committee of the Faculty of Pharmacy, University of Kufa (Najaf, Iraq; reference no.: 2987), and participation in the study was voluntary. Data were collected over a period of 1 month in March 2020.

Questionnaire

The questionnaire was developed based on similar studies [17–19]. The questions and answers were in the Arabic language.

The translation was verified using the forward–backward method. The validity of the content of the questionnaire was determined by academicians with survey research experience and community pharmacists.

The questionnaire was shared in a small pilot sample of 34 participants to examine the reliability and ambiguity of questions. Participants from the pilot study were not included in the study sample.

The questionnaire consisted of five sections. The first section included six questions (Q1–5 and Q28) on the demographic characteristics of participants. The second section included nine questions (Q10–18) that evaluated the knowledge of basic inquiries when dispensing antibiotics. Respondents provided answers on a 5-point Likert scale (except for Q15).

In the third section, one question (Q6) was asked to determine the frequency of DAWRx. The fourth section consisted of five questions (Q19 and 20 and Q25–27) that inquired regarding the person who recommended the patient to take an AWRx. Choices in the third and fourth sections were similar to those in the second section.

The fifth section included seven questions (Q7–9 and Q21–24) designed to collect data on age groups to whom AWRx was dispensed, main indications, the daily amount of dispensing, and the three most frequently dispensed AWRx. Apart from the questions on age groups, the respondents were allowed to write their own answers for the remaining questions in this section.

Statistical analysis

Descriptive statistics are presented as the frequency and percentage of participants' characteristics. For the knowledge section, the Likert scale responses were converted to numbers from one (corresponds to never) to five (corresponds to always). Some questions required reverse coding. The mean was calculated and compared with Likert scale intervals. Knowledge was considered to be satisfactory when the calculated mean was in the final Likert scale interval (4.2–5). Otherwise, the knowledge was labeled as average or below average. Q15 was excluded from the analysis because the answers were obtained on a 4-point scale. The response to Q6 was considered as no dispensing if the response was "never," low prevalence if the response was "rarely" or "sometimes," and high prevalence if the response was "often" or "always." In section four, the frequencies and percentages of each situation are presented in a table.

All responses regarding the daily amount dispensed were analyzed using descriptive statistics and by performing the association analysis. In addition, responses to the indication question were analyzed by extracting an integrated theme and presented as frequencies and percentages. Responses that included words or characters of no clear medical condition or symptom, such as "I don't know" and none noteworthy were considered as "No condition provided."

Responses to the three most frequent AWRx dispensed were analyzed by counting three antibiotic options indicated by each participant. Non-identifiable words and characters, duplicates, and non-antibiotic responses were labeled as missing values. Coding and analysis of data were conducted using SPSS version 22. When required, the Chi-square or Fisher's exact test was performed to investigate the presence of an association between the participants' characteristics, dispensing inquiries knowledge, and the prevalence of DAWRx. A p-value of less than 0.05 indicated statistical significance.

RESULTS

Participants' demographics

Overall, four hundred and three participants responded to the questionnaire. Eight pharmacists were excluded (six lacked practice experience and two worked outside Iraq), and thirty-two respondents were not pharmacy degree holders. Thus, finally, 363 participants were included in this study. The respondents mainly had three years of experience. Online reference databases (mainly Medscape, n=169/180) were the sources of medical knowledge for 52.94% (n = 340) of the participants. Baghdad was the most frequent place of work (48%; Table 1).

Age groups receiving antibiotics dispensed without a prescription

The age group of 18 to 65 years was the most common group receiving AWRx, with approximately 72% of the study respondents. Furthermore, sixty-six participants reported DAWRx to pediatric (age of 1 to 12 years) patients (Table 1). Although this frequency is lower, it is concerning.

Main indications for dispensing an antibiotic without a prescription

Ear, nose, and throat (ENT) conditions such as otitis, sinusitis, and tonsillitis were frequent conditions for which antibiotics were dispensed without a prescription, as reported by 153 participants (45.95%; Table 1).

Table 1. Characteristics of the study participants, the age groups receiving antibiotics dispensed without a prescription (NPA), and the medical conditions for their dispensing.

Demographic characteristics	**Frequency (%)**
Gender (n=363)	
Male	165 (45.5)
Female	198 (54.5)
Degree (n=363)	
Diploma	34 (9.4)
Bachelor's	297 (81.8)
A postgraduate study program (PharmD, PGDip, MSc and PhD)	32 (8.8)
The participants' age groups (n=363)	
20 – less than 25	136 (37.5)
25 – less than 30	134 (36.9)
30 or more	93 (25.6)
Experience years (n=363)	
Less than 3 years	183 (50.4)
3 – less than 6 years	88 (24.2)
6 – less than 9 years	40 (11)
9 years and more	52 (14.3)
Working place (n=363)	
Baghdad	173 (48.1)
Najaf	50 (13.9)
Wasit	24 (6.6)
Babil	17 (4.7)
Dhi Qar	18 (5)
Karbala	17 (4.7)
Basra	13 (3.6)
Diyala	8 (2.2)
Anbar	7 (1.9)
Ninawa and Muthannah	5 (1.4 each)

Demographic characteristics	Frequency (%)
Maysan, Qadisiya, Salahuldin and Kirkuk	4 (1.1 each)
Erbil, Duhok and Sulaimanya	7 (1.93)
Source of knowledge[ǂ] (n=363, valid n=340)	
Online Source (Internet & Social media)	69 (20.29)
Online reference databases	180 (52.94)
Reference Textbooks	152 (44.71)
Journal Articles	21 (6.18)
Publications of healthcare organizations	22 (6.47)
Colleagues	11 (3.24)
Other sources*	4 (1.18)
The age groups receiving antibiotics dispensed without a prescription (n=363)	
Less than a year-old infants	2 (0.55)
1 – 6 year-old children	43 (11.85)
6 – 12 year-old children	23 (6.34)
12 – 18 year-old teenagers	30 (8.26)
18 – 65 year-old adults	260 (71.63)
More than 65 year-old elderly patients	5 (1.37)
The medical conditions for which an antibiotic was dispensed without a prescription (n=363, valid n=333)[§]	
Fever	100 (30.03)
Cold & Flu	54 (16.22)
Otitis, Sinusitis or Tonsillitis	153 (45.95)
Cough or Respiratory infection	93 (27.93)
Oral or Dental infection	19 (5.71)
Gastroenteritis	47 (14.11)
Genito or Urinary tract infection	70 (21.02)
Non-responsiveness of a patient to a previous antibiotic	28 (8.41)
Other conditions (skin lesion, allergy event, asthma, or arthritis)	63 (12.31)

* reported as self-learning events and college study, n: number of respondents.

ǂ written responses were provided and categories of sources were extracted.

§ no condition provided in 30 respondents.

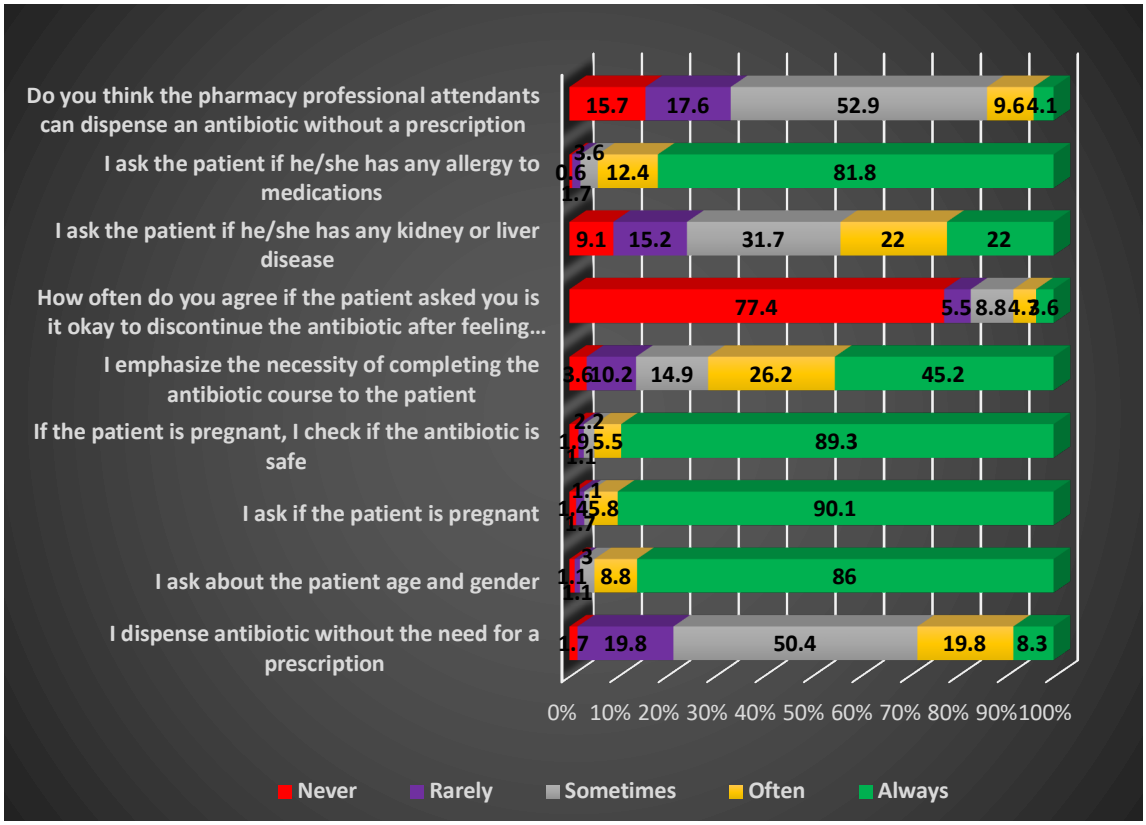

Figure 1. The questionnaire items for antibiotic dispensing inquiries and the percentages of the participants' responses.

Knowledge of antibiotic dispensing inquiries

The majority of the participants provided positive responses to knowledge questions on antibiotic dispensing inquiries. However, 56% of the respondents did not regularly examine for the presence of renal or hepatic diseases (Figure 1). A significant association was noted among the prevalence of DAWRx, age, and attitude toward DAWRx ($p < 0.05$) (Table 2).

Prevalence of DAWRx

Of 363, only six pharmacists (1.7%) did not dispense AWRx. Furthermore, 102 respondents (28.1%) had a high prevalence of DAWRx. The prevalence of DAWRx was significantly associated with sex, academic degree, age, and attitude toward DAWRx ($p < 0.05$) (Table 3).

Source of DAWRx recommendation

According to more than 70% of the respondents, the most frequent source of DAWRx was the patient's request due to prior experience of improvement with the antibiotic or recommendation by a family member. The results of chi-square analysis indicated that responses in these two situations were significantly associated with the participants' age categories (<30 and ≥30 years), years of experience (<2, 2–5, and ≥5), prevalence of DAWRx, and number of antibiotics dispensed daily without a prescription ($p < 0.05$). Other than the question on dispensing an antibiotic to a patient requesting an AWRx due to prior experience of improvement, the responses of the participants to the remaining questions were significantly associated with the knowledge of dispensing inquiries (Table 4).

Table 2. Association of the knowledge of dispensing inquiries with the prevalence of DAWRx and the study participants' characteristics.

The variables (n)		Knowledge of dispensing inquiries		p-value
		Average or below	Satisfactory	
Prevalence of DAWRx (n=357)	Low prevalence (n=255)	78 (30.6%)	177 (69.4%)	0.009*
	High prevalence (n=102)	46 (45.1%)	56 (54.9%)	
The attitude towards DAWRx (n=363)	No dispensing attitude (n=57)	13 (22.8%)	44 (77.2%)	0.00043*
	Low dispensing attitude (n=256)	86 (33.6%)	170 (66.4%)	
	High dispensing attitude (n=50)	29 (58%)	21 (42%)	
Gender (n=363)	Female (n=198)	61 (30.8%)	137 (69.2%)	0.052
	Male (n=165)	67 (40.6%)	98 (59.4%)	
Degree (n=363)	Diploma (n=35)	13 (37.1%)	22 (62.9%)	0.739
	Bachelor's (n=297)	106 (35.7%)	191 (64.3%)	
	PG study (PharmD, PGDip, MSc, PhD) (n=31)	9 (29%)	22 (71%)	
Participant age (n=363)	less than 30 year-old (n=270)	103 (38.1%)	167 (61.9%)	0.04986*
	30 or more year-old (n=93)	25 (26.9%)	68 (73.1%)	
Duration of practice experience (n=363)	Less than 3 year-experience (n=183)	75 (41%)	108 (59%)	0.151
	3 - less than 6 year-experience (n=88)	26 (29.5%)	62 70.5%)	
	6 - less than 9 year-experience (n=40)	12 (30%)	28 (70%)	
	9 or more year-experience (n=52)	15 (28.8%)	37 (71.2%)	

Table 3. Association of the prevalence of DAWRx and the study participants' characteristics.

The variables (n)		Prevalence of DAWRx		p-value
		Low prevalence	High prevalence	
The attitude towards DAWRx (n=357)	No dispensing attitude (n=53)	43 (81.1%)	10 (18.9%)	0.002*
	Low dispensing attitude (n=254)	186 (73.2%)	68 (26.8%)	
	High dispensing attitude (n=50)	26 (52%)	24 (48%)	
Gender (n=357)	Female (n=196)	155 (79.1%)	41 (20.9%)	0.000413*
	Male (n=161)	100 (62.1%)	61 (37.9%)	
Degree (n=357)	Diploma (n=35)	25 (71.4%)	10 (28.6%)	0.49
	Bachelor's (n=291)	205 (70.4%)	86 (29.6%)	
	PG study (PharmD, PGDip, MSc, PhD) (n=31)	25 (80.6%)	6 (19.4%)	
Participant age (n=357)	20-25 (n=185)	132 (71.4%)	53 (28.6%)	0.036*
	26-30 (n=104)	75 (72.1%)	29 (27.9%)	
	31-35 (n=43)	33 (76.7%)	10 (23.3%)	
	36-40 (n=12)	4 (33.3%)	8 (66.7%)	
	41 year or older (n=13)	11 (84.6%)	2 (15.4%)	
Duration of practice experience (n=357)	Less than 3 year-experience (n=178)	130 (73%)	48 (27%)	0.809
	3 - less than 6 year-experience (n=88)	60 (68.2%)	28 (31.8%)	
	6 - less than 9 year-experience (n=39)	29 (74.4%)	10 (25.6%)	
	9 or more year-experience (n=52)	36 (69.2%)	16 (30.8%)	

Table 4. The questionnaire questions for DAWRx recommendation source, the corresponding participants' responses and their association with the knowledge of dispensing inquiries, the prevalence of DAWRx, daily number of antibiotics dispensed without a prescription, and participants' age, gender, and experience.

Questionnaire questions	Frequency (percentage) of responses					p-value					
	Never	Rarely	Sometimes	Often	Always	Knowledge	Prevalence	Number[ǂ]	Age[§]	Gender	Experience
A flu patient asking for an appropriate treatment.	160 (44.1)	92 (25.3)	82 (22.6)	20 (5.5)	9 (2.5)	0.001	0.000002	0.123	0.246	0.023[#1]	0.329[#2]
A patient requesting an antibiotic because of his/her previous experience of improvement with the antibiotic.	31 (8.5)	62 (17.1)	172 (47.4)	65 (17.9)	33 (9.1)	0.453	0.003	0.003	0.037	0.899	0.001
A patient or his/her family member insisting on purchasing an antibiotic.	35 (9.6)	68 (18.7)	153 (42.1)	75 (20.7)	32 (8.8)	0.0002	0.059	0.076	0.025	0.363	0.036
A patient requesting an antibiotic due to his/her friend's recommendation (based on an experience of improvement with the antibiotic).	91 (25.1)	98 (27)	116 (32)	46 (12.7)	12 (3.3)	0.003	0.255	0.057	0.529	0.898	0.144[#3]
A patient requesting an antibiotic due to recommendation of any other individual (other than the prescriber physicians).	102 (28.1)	88 (24.2)	119 (32.8)	38 (10.5)	16 (4.4)	0.005	0.119	0.133	0.127	0.625	0.168

* Each question sentence was followed by " Based on your experience and practice, how often an antibiotic was dispensed without a prescription in such situation"

[ǂ] Number of antibiotics dispensed daily without a prescription. [§] Age of participant.

Likelihood ratios were reported for #1, #2, and #3, while p-values were also similar and equal to 0.021, 0.361, and 0.132, respectively)

Daily number of antibiotics dispensed without a prescription

The median of valid numbers provided by the participants (n = 356) was nine, with an interquartile range of 15. Seven values were missing. A total of 115 participants (about 32%) dispensed more than 10 antibiotics daily without a prescription. Half of them dispensed more than 20 AWRx daily. The analysis revealed a significant association with sex, academic degree, attitude toward DAWRx, and the prevalence of DAWRx ($p < 0.05$; Table 5).

Table 5. Association of daily number of AWRx dispensed with the prevalence of DAWRx and the participants' characteristics

The variables (n)		**Number of AWRx dispensed daily**				p-value
		5 or less (n, %)	6-10 (n, %)	11-20 (n, %)	21 or more (n, %)	
Prevalence of DAWRx (n=350)	Low prevalence dispensing (n=250)	113 (45.2%)	70 (28%)	36 (14.4%)	31 (12.4%)	0.004*
	High prevalence dispensing (n=100)	29 (29%)	25 (25%)	23 (23%)	23 (23%)	
The attitude towards DAWRx (n=356)	No dispensing attitude (n=56)	25 (44.6%)	18 (32.1%)	7 (12.5%)	6 (10.7%)	0.021*
	Low dispensing attitude (n=252)	108 (42.9%)	68 (27%)	38 (15.1%)	38 (15.1%)	
	High dispensing attitude (n=48)	10 (20.8%)	12 (25%)	14 (29.2%)	12 (25%)	
Gender (n=356)	Female (n=197)	92 (46.7%)	51 (25.9%)	28 (14.2%)	26 (13.2%)	0.038*
	Male (n=159)	51 (32.1%)	47 (29.6%)	31 (19.5%)	30 (18.9%)	
Academic degree (n=356)	Diploma (n=33)	9 (27.3%)	14 (42.4%)	1 (3%)	9 (27.3%)	0.034*
	Bachelor's (n=292)	120 (41.1%)	74 (25.3%)	53 (18.2%)	45 (15.4%)	
	Postgraduate study (PharmD,PGDip,MSc,PhD) (n=31)	14 (45.2%)	10 (32.3%)	5 (16.1%)	2 (6.5%)	
Participant age (n=356)	Less than 25 year-old (n=132)	54 (40.9%)	32 (24.2%)	19 (14.4%)	27 (20.5%)	0.575
	25 - less than 30 year-old (n=131)	51 (38.9%)	40 (30.5%)	24 (18.3%)	16 (12.2%)	
	30 year-old or more (n=93)	38 (40.9%)	26 (28%)	16 (17.2%)	13 (14%)	

The variables (n)		Number of AWRx dispensed daily				p-value
		5 or less (n, %)	6-10 (n, %)	11-20 (n, %)	21 or more (n, %)	
Duration of practice experience (n=356)	Less than 3 year-experience (n=180)	77 (42.8%)	47 (26.1%)	24 (13.3%)	32 (17.8%)	0.664
	3 - less than 6 year-experience (n=84)	31 (36.9%)	27 (32.1%)	16 (19%)	10 (11.9%)	
	6 - less than 9 year-experience (n=40)	13 (32.5%)	10 (25%)	10 (25%)	7 (17.5%)	
	9 or more year-experience (n=52)	22 (42.3%)	14 (26.9%)	9 (17.3%)	7 (13.5%)	
Knowledge of dispensing inquiries (n=356)	Average knowledge or below (n=126)	43 (34.1%)	35 (27.8%)	22 (17.5%)	26 (20.6%)	0.183
	Satisfactory knowledge (n=230)	100 (43.5%)	63 (27.4%)	37 (16.1%)	30 (13%)	

Antibiotics dispensed without a prescription

Overall, the three most frequent AWRx were amoxicillin, azithromycin, and cefixime for the pediatric patients, adults, and older individuals (>65 years; Figure 2A). The product containing a combination of amoxicillin/clavulanate was frequently dispensed without a prescription for pediatric, adult, and older patients according to 79 (7.71%), 109 (10.6%), and 89 (8.78%) of the participants, respectively. Furthermore, a trend of DAWRx of ciprofloxacin in adults and older patients was highlighted in 75 responses (Figure 2B). Moreover, seventy-two responses underlined the DAWRx of injectable antibiotics, with 70% of these responses particularly indicating the dispensing of ceftriaxone without a prescription.

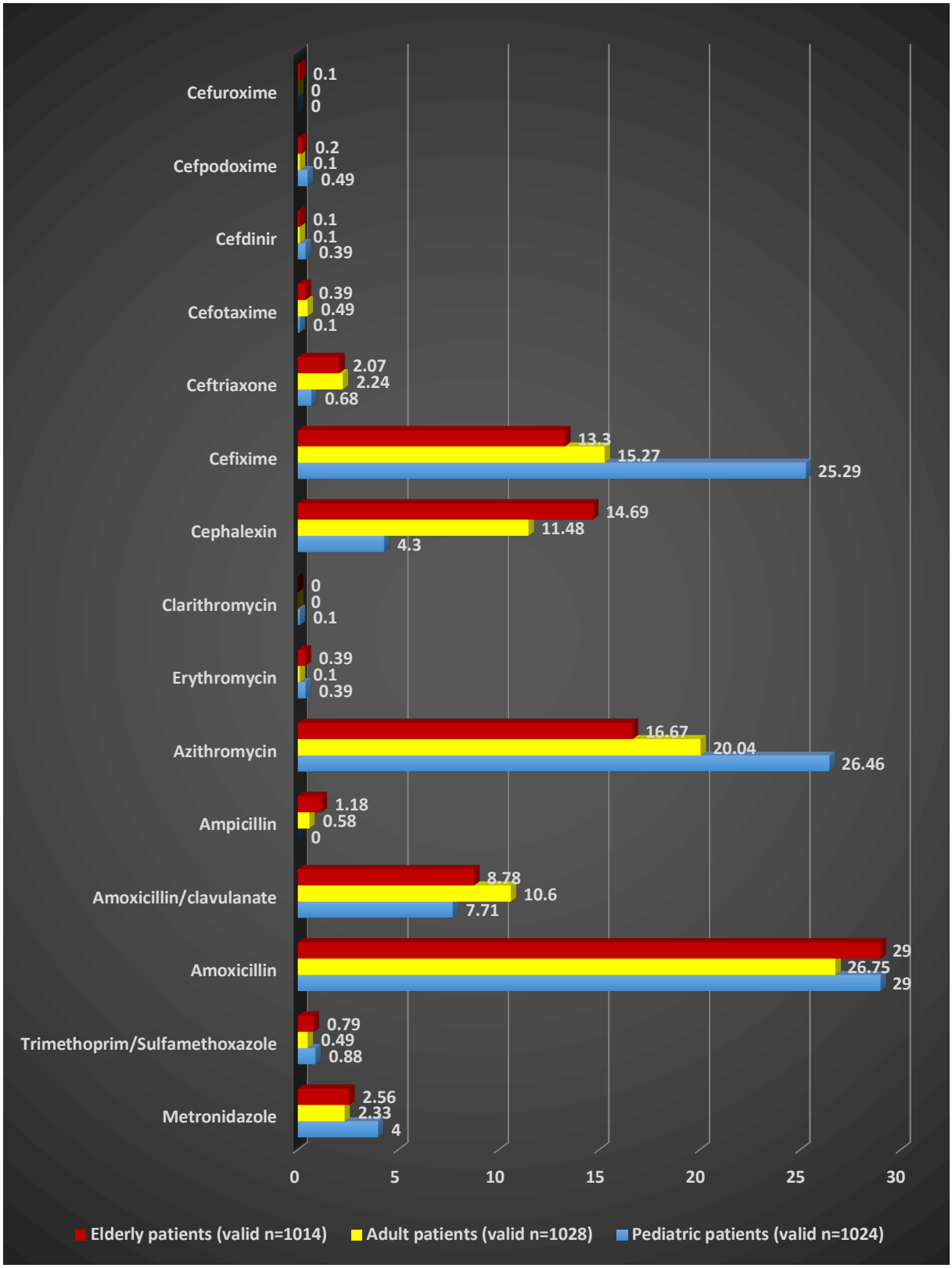

Figure 2A. The three most frequent antibiotics dispensed without a prescription and the patients' age groups receiving the AWRx (total number of responses=1089 for each category of patient age group). The participants responded to an open-ended question on each age group category, which was "Based on your experience and practice, what are the three most frequent antibiotics dispensed without a prescription to".

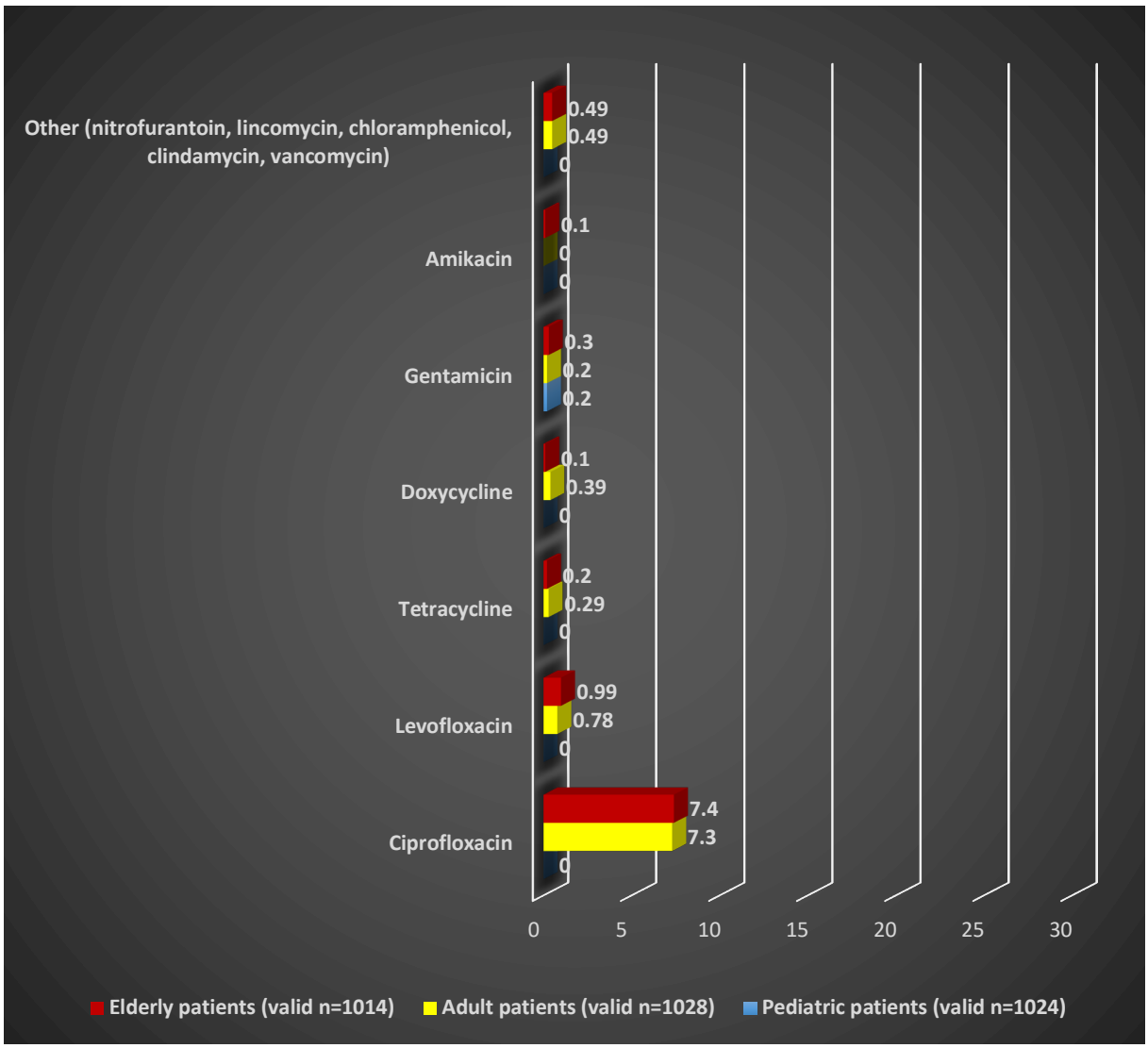

Figure 2B. The three most frequent antibiotics dispensed without a prescription (AWRx) and the patients' age groups receiving the AWRx (total number of responses=1089 for each category of patient age group). The participants responded to an open-ended question on each age group category, which was "Based on your experience and practice, what are the three most frequent antibiotics dispensed without a prescription to".

DISCUSSION

To our knowledge, the current study is the first to investigate the practice of DAWRx in multiple regions of Iraq. Previous studies have reported the practice of DAWRx in Baghdad province and emphasized the significance of a nationwide insight into the views and practice of professional attendants in pharmacies towards DAWRx [14,15]. Accordingly, national strategies and interventional programs can be developed and tailored to tackle this public health problem.

Our results revealed that almost all the participants indulged in DAWRx in their practice. In addition, approximately 32% of the participants dispensed 10 or more

antibiotics daily. This number is lower than that reported in a similar study conducted in Baghdad where the percentage was 60% [15].

In this study, 15.7% of the participants exhibited a disagreeable attitude to DAWRx. Al-Taie et al. reported a higher percentage of disagreeable attitude (41.4%) [20]. The variation in the findings may be attributed to a methodological discrepancy. Al-Taie et al. used a self-administered questionnaire completed during a structured interview. The social desirability bias may have affected participants and their reporting may have been inclined toward more socially acceptable responses instead of participants' views.

Adults (71.6%) comprised the majority of the patients receiving AWRx. The study underlined a particularly concerning finding of DAWRx to pediatric patients (18.2%). Previous studies did not identify a pattern of DAWRx to pediatric patients. However, DAWRx increases the risk of resistance emergence, development of adverse effects, and concealment of underlying conditions [21,22]. The susceptibility of pediatric patients to these risks is further increased by significant variations in the developmental pharmacology and pathophysiology of diseases [23,24]. Targeted intervention strategies are urgently required to effectively address this alarming issue and prevent such dangerous practices.

The frequently dispensed AWRx were amoxicillin, cefixime (in pediatrics and adults), and azithromycin. The pattern is similar to that observed in other Iraqi and several Middle-Eastern studies [15,17,20,25,26]. Moreover, the study revealed a distressing practice of dispensing injectable antibiotics (predominantly ceftriaxone). A similar practice was reported in Pakistan and Saudi Arabia [27,28].

Overall, AWRx were mainly dispensed to patients with respiratory infections, fever, and ENT infections. Dispensing AWRx to patients with similar conditions was identified in other studies [15,17,19,20,25,26]. Notably, some participants (n = 28/333) in this study disclosed the practice of DAWRx to patients with non-responsiveness to previous antibiotic use. Furthermore, most participants (>70%) dispensed AWRx due to patients' experience of improvement or a family member's recommendation. A similar situation was reported in local studies [14,15,20]. The accessibility of community pharmacies combined with pharmacists' attitude to help their patients partially explain such situations of DAWRx [29].

DAWRx to patients based on the experience of improvement implies the patient's assumption of possessing adequate knowledge to manage their medical conditions. Sharing experience with other patients to indulge in self-medication triggers a wave ripple effect on a community scale, and its management can become more problematic over time. The situation is further complicated when a patient encounters an AMR. This requires an escalation in antibiotic therapy, which often involves the use of an alternative antibiotic for successful management. Sharing such experience of improvement would accelerate AMR development and break another line of public defense against infection. A collaborative initiative that examines various enabling contexts for the use of AWRx and develops contingency plans to address them is a step forward toward the solution. Additional effort is required to elucidate the ramifications of the use of AWRx to patients to enhance patient education.

This study has several limitations that should be considered before drawing any conclusion. The close-ended nature of the questionnaire queries may have limited the participant's ability to express additional situations that contributed to DAWRx. Moreover, some regions were represented by fewer participants than others. This hinders the generalizability of study findings. Further investigation with a

comprehensive mixed-method design and a larger sample size is necessary for a better representation of the practice of DAWRx in all Iraqi regions.

RECOMMENDATIONS

The study revealed a prevalent practice of DAWRx. DAWRx was reported based on the recommendation from pharmacies as well as upon patients' request. Adults and pediatric patients received AWRx for various conditions, such as respiratory, ENT, GIT, and GUT problems. AWRx commonly dispensed were amoxicillin, cefixime, and azithromycin, and the emergence of a concerning dispensing pattern of injectable antibiotics (mainly ceftriaxone) was noted. Moreover, the prevalence of DAWRx was significantly associated with sex, dispensing attitude and knowledge, and patients' requesting of AWRx due to their experience of improvement. Enforcement of regulations on pharmacies is required to restrict the practice of DAWRx. Educational topics on antibiotic stewardship programs should be included in the undergraduate study of pharmacy students to ensure a better antibiotic dispensing practice in the future.

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REFERENCES

1. Ayukekbong JA, Ntemgwa M, Atabe AN. The threat of antimicrobial resistance in developing countries: causes and control strategies. Antimicrob Resist Infect Control. 2017;6(1):47.
2. Hersh AL, Newland JG, Beekmann SE, Polgreen PM, Gilbert DN. Unmet medical need in infectious diseases. Clin Infect Dis. 2012;54(11):1677–8.
3. Bartlett JG, Gilbert DN, Spellberg B. Seven ways to preserve the miracle of antibiotics. Clin Infect Dis. 2013;56(10):1445–50.
4. Cars O, Nordberg P. Antibiotic resistance – The faceless threat. Int J Risk Saf Med. 2005;17(3–4):103–10.
5. Almaaytah A, Mukattash TL, Hajaj J. Dispensing of non-prescribed antibiotics in Jordan. Patient Prefer Adherence. 2015;9:1389–95.
6. Halboup A, Abdi A, Ahmed M, Al-Qadasi F, Othman GQ. Access to antibiotics without prescription in community pharmacies in Yemen during the political conflict. Public Health. 2020;183:30–5.
7. Mansour O, Al-Kayali R. Community Pharmacists' Role in Controlling Bacterial Antibiotic Resistance in Aleppo, Syria. Iran J Pharm Res. 2017;16(4):1612–20.
8. Zapata-Cachafeiro M, González-González C, Váquez-Lago JM, López-Vázquez P, López-Durán A, Smyth E, et al. Determinants of antibiotic dispensing without a medical prescription: a cross-sectional study in the north of Spain. J Antimicrob Chemother. 2014;69(11):3156–60.
9. Plachouras D, Kavatha D, Antoniadou A, Giannitsioti E, Poulakou G, Kanellakopoulou K, et al. Dispensing of antibiotics without prescription in Greece, 2008: another link in the antibiotic resistance chain. Euro Surveill. 2010;15(7):19488.
10. Santa-Ana-Tellez Y, Mantel-Teeuwisse AK, Dreser A, Leufkens HGM, Wirtz VJ. Impact of over-the-counter restrictions on antibiotic consumption

in Brazil and Mexico. PLOS ONE. 2013;8(10):e75550.
11. Grigoryan L, Burgerhof JGM, Degener JE, Deschepper R, Lundborg CS, Monnet DL, et al. Determinants of self-medication with antibiotics in Europe: the impact of beliefs, country wealth and the healthcare system. J Antimicrob Chemother. 2008;61(5):1172–9.
12. Haddadin RN, Alsous M, Wazaify M, Tahaineh L. Evaluation of antibiotic dispensing practice in community pharmacies in Jordan: A cross sectional study. PLOS ONE. 2019;14(4): e0216115.
13. Al-Jumaili AA, Hussain SA, Sorofman B. Pharmacy in Iraq: history, current status, and future directions. Am J Health-Syst Pharm. 2013;70(4):368–72.
14. Mikhael E. Evaluating the Rationality of Antibiotic Dispensing in Treating Common Cold Infections among Pharmacists in Baghdad – Iraq. Br J Pharm Res. 2014;4:2653–61.
15. Alkadhimi A, Dawood OT, Hassali MA. Dispensing of antibiotics in community pharmacy in Iraq: a qualitative study. Pharm Pract. 2020;18(4):2095.
16. Ibrahim IR, Palaian S, Ibrahim MI. Assessment of diarrhea treatment and counseling in community pharmacies in Baghdad, Iraq: A simulated patient study. Pharm Pract (Granada). 2018;16(4):1313.
17. Hadi MA, Karami NA, Al-Muwalid AS, Al-Otabi A, Al-Subahi E, Bamomen A, et al. Community pharmacists' knowledge, attitude, and practices towards dispensing antibiotics without prescription (DAwP): a cross-sectional survey in Makkah Province, Saudi Arabia. Int J Infect Dis. 2016;47:95–100.
18. Majid Aziz M, Haider F, Rasool MF, Hashmi FK, Bahsir S, Li P, et al. Dispensing of Non-Prescribed Antibiotics from Community Pharmacies of Pakistan: A Cross-Sectional Survey of Pharmacy Staff's Opinion. Antibiotics. 2021;10(5):482.
19. Abuirmeileh A, Samara S, Alkhodari A, Bahnassi A, Talhouni A, Hayallah AM. Antibiotic dispensing without prescription in Jordanian community pharmacies: A pharmacist's perspective. Bull Pharm Sci. 2014; 37(1):51–63.
20. Al-Taie A, Hussein AN, Albasry Z. A Cross-Sectional Study of Patients' Practices, Knowledge and Attitudes of Antibiotics among Iraqi Population. J Infect Dev Ctries. 2021;15(12):1845–53.
21. Morgan DJ, Okeke IN, Laxminarayan R, Perencevich EN, Weisenberg S. Non-prescription antimicrobial use worldwide: a systematic review. Lancet Infect Dis. 2011;11(9):692–701.
22. Liu J. Tackling the global non-prescription use of antibiotics. Lancet Infect Dis. 2020;20(2):169–70.
23. Kearns GL, Abdel-Rahman SM, Alander SW, Blowey DL, Leeder JS, Kauffman RE. Developmental pharmacology--drug disposition, action, and therapy in infants and children. N Engl J Med. 2003; 349(12):1157–67.
24. Klassen TP, Hartling L, Craig JC, Offringa M. Children are not just small adults: the urgent need for high-quality trial evidence in children. PLOS Med. 2008;5(8):e172.
25. Muhammed R, Al-Ani A, Yassen A. Self-Medication with Antibiotic among Public Population in Erbil City. J Pharm Res Int. 2021;33:25–33.
26. Alhomoud F, Aljamea Z, Almahasnah R, Alkhalifah K, Basalelah L, Alhomoud FK. Self-medication and self-prescription with antibiotics in the Middle East-do they really happen? A systematic review of the prevalence, possible reasons, and outcomes. Int J Infect Dis. 2017;57:3–12.

27. Torres NF, Solomon VP, Middleton LE. Pharmacists' practices for non-prescribed antibiotic dispensing in Mozambique. Pharm Pract. 2020;18(3):1965.
28. Al Rasheed A, Yagoub U, Alkhashan H, Abdelhay O, Alawwad A, Al Aboud A, et al. Prevalence and Predictors of Self-Medication with Antibiotics in Al Wazarat Health Center, Riyadh City, KSA. BioMed Res Int. 2016;2016:3916874.
29. Ibrahim I, Al-Tukmagi H, Wayyes A. Attitudes of Iraqi society towards the role of community pharmacists. Innov Pharm. 2013;4(2):114.