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Research Article

Community Pharmacists' knowledge and practice towards antibiotic resistance in Kuwait

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ABSTRACT

The misuse of antibiotics is a factor contributing to the rise of resistance particularly in countries where there is a lack of procedures for restricting and auditing antibiotic prescriptions. There is very limited data from Kuwait exploring the community pharmacists' role towards reducing antibiotic misuse and resistance and so the aim of this study is to assess community pharmacists' knowledge and practice towards antibiotic resistance in Kuwait. A cross sectional study was conducted among the primary care centers' pharmacists in Al-Asema and Hawally districts in Kuwait between June-July 2018, using a self-administered online questionnaire. Out of 274, 156 pharmacists completed the questionnaire. A total of 148 pharmacists (95%) strongly agreed/agreed that antibiotics can cause allergic reaction. Moreover, results showed that a significant proportion of the participants (n= 42, 27.6%) never take part in antimicrobial awareness campaigns to promote the optimal use of antibiotics. Pharmacists in primary care settings in Kuwait have excellent knowledge and good practice toward antibiotics resistance. These findings will aid in encouraging collaborative work between pharmacists and other health care professional to limit antibiotic resistance in Kuwait and provide further insight in designing future interventions to reduce antibiotic resistance in Kuwait.

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INTRODUCTION

Antibiotic resistance is one of the major threats within the medical field nowadays (Tafa, Endale, & Bekele, 2017). When infections can no longer be treated by first-line antibiotics, more expensive medicines must be used. A longer duration of illness and treatment, often in hospitals, increases health care costs as well as the economic burden on families and societies. Organ transplantations, chemotherapy and surgeries become much more dangerous without effective antibiotics for the prevention and treatment of infections (WHO, 2020). A recent report from The United States (USA) Center for Disease Control and Prevention (CDC, 2019) indicated that more than 2.8 million antibiotic-resistant infections occur in the USA

each year, and more than 35,000 people die as a result. The latest Annual Epidemiological Report for 2019 for antimicrobial resistance in Europe shows that antimicrobial resistance is still a challenge for the EU/EEA, with the percentages of resistance to vancomycin – a last-line antibiotic – in *Enterococcus faecium* bloodstream infections almost doubling between 2015 and 2019 (European Centre for Disease Prevention and Control, (ECDC), 2020).

In 2006, a study exploring the patterns of antibiotic resistance in China, Kuwait and the USA displayed that Kuwait had the second rapid growth rate of resistance between 1999 to 2003 in hospitals for different bacterial pathogen (Zhang et al., 2006). In 2012, Habibzadeh explained that the increasing trend

of antibiotic resistance is not restricted to Europe and that the situation is worse in the Middle East where antibiotics are used more extensively; with many reports of bacterial resistance from Iran, Lebanon, United Arab Emirates, Turkey, and other countries in the region. He reports that antibiotics are cheap in most countries in the Middle East and can be obtained from a pharmacy without prescription and that culture is also an important contributing factor, because non-professionals in the region can give advice to their friends and relatives about use of medicines (including antibiotics).

In Kuwait and the Gulf Cooperation Council (GCC) countries, inappropriate prescribing of antibiotics and self-medication are reported as risk factors for increasing antibiotic resistance. Additionally, lack of policies available for limiting the use of inappropriate antibiotic use is another reason for the increase in antibiotic resistance in the region (Aly & Balkhy, 2012; Memish et al., 2007). A cross-sectional study involving 50 primary healthcare centres across five governorates of Kuwait reported that up to 39.1% of prescriptions involved an antibiotic but did not identify whether the prescriptions were appropriate or not (Awad & Al-Saffar, 2010). In 2017, a systematic review by Alhomoud et al (2017) reported that the prevalence of self-medication and self-prescriptions is alarmingly high among members of the public in the Middle East (ranging between 19% to 82%). While a recent systematic review reported that the overall prevalence of people who had self-medicated antibiotics within the GCC countries ranged from 14% to 73%, with the highest prevalence of self-medication reported in Saudi Arabia (55%), followed by Kuwait (28%), Oman (18%) and Qatar (14%) (Almohammed & Bird, 2019).

Pharmacists have a unique position within health care systems because they are the most accessible health care professional; they can intervene in the process of inappropriate antibiotic use as they are the medicine experts (FIP, 2015). Although pharmaceutical care is still somewhat underdeveloped in Kuwait, a recent survey within the public indicated that they received instructions about antibiotic use from pharmacists more than from any other healthcare providers (Awad & Aboud, 2015). With that responsibility, pharmacists must be prepared with their expertise knowledge and supported with local strategies to combat antibiotic resistance while taking into

consideration the cultural beliefs and behaviours (Ledingham et al, 2019). The aim of the study was to determine pharmacists' knowledge and practice regarding antibiotic resistance in primary care settings in Kuwait.

MATERIALS AND METHODS

Study design and participants: A cross-sectional survey was conducted using an anonymous, structured, online questionnaire. The study was conducted in Kuwait, a Middle Eastern country with an area of 17,820 km² and an estimated population of 4,464,521 people; 30.6% of whom are Kuwaitis (Central Statistical Bureau, 2020). In Kuwait, the healthcare system comprises a public and a private sector. The public sector is the largest provider of healthcare that provides comprehensive advanced health services free of charge for the Kuwaiti nationals. A public insurance scheme exists to provide the same services for the non-Kuwaitis at reduced cost. The public sector consists of primary, secondary, and tertiary levels of healthcare delivery. Primary care is provided through healthcare centres (also named as polyclinics) disseminated over the six governorates of Kuwait (Albassam et al, 2020). The primary healthcare centres offer health services including medical care from general practitioners, dentistry, maternity care, nursing care, preventive care, family medicine and pharmaceuticals. Also, primary care is responsible for coordinating patient care among specialists at the secondary and tertiary levels of care. Each primary healthcare centre has a designated pharmacy led by full-time working pharmacists (Albassam et al, 2020) and so pharmacists working within the community were recruited to participate in the study.

Data collection: The total number of pharmacists working in the governmental sector in Al-Asema district was 139 and in Hawalli district was 135. All pharmacists within both districts were included in the study (274 pharmacists). Pharmacy technicians were excluded from the study. The survey was distributed through an official WhatsApp® group for primary care centre pharmacists in Al-Asema and Hawalli district, which was created by the head of primary care centres for pharmacists within these districts to ease communication between the pharmacists. The study was conducted between June and July 2018. A reminder WhatsApp® message was sent to all

pharmacists with the questionnaire link a week after the initial survey link was sent out.

Questionnaire design: The questionnaire was written in English and was adapted from previously published studies and was modified, considering our study settings, to meet the study's aim (Khan et al., 2016; Sarwar et al., 2018). The questionnaire was subjected to both face and content validation within the research team and some modifications were incorporated such as reducing the number of questions, altering their order and removing ambiguous terminology. The questionnaire was then designed and disseminated for piloting using SurveyMonkey®, an online survey development cloud-based software. At the start of the questionnaire information about the study was provided, including the duration to complete the questionnaire (15 minutes) and assurance for confidentiality and autonomy. Consent was sought if the participants accessed the questionnaire link after reading the information sheet. The questionnaire did not ask for any personal identifiable participant details. Data regarding the participants' gender, age and years of experience were the only demographic data collected. Piloting was initiated on ten pharmacists working in primary care centres to detect any ambiguous questions. There were no further modifications required following the pilot. The questionnaire comprised of three sections: The first section included questions related to the participants' demographics such as age, gender, and years of practicing as a pharmacist. The second part contained eight questions that evaluated pharmacists' knowledge toward antibiotic resistance using a 5-point Likert scale (1= strongly disagree, 2= disagree, 3= neutral, 4= agree, 5= strongly agree). The final part of the questionnaire consisted of 11 question related to pharmacists' practice regarding antibiotic resistance. It measured the frequency of such a practice also using a 5-point Likert scale (1= Never, 2= Rarely, 3= occasionally, 4= often, 5=Always). Two optional open-ended questions were included in the questionnaire which were: 1-What are the key counselling points that you would talk to patients about when dispensing an antibiotic? And 2-How do you or can you prevent or reduce antibiotic resistance within the community?

Data analysis: Data was analysed using SPSS version (21.0). The researchers (AT & FA) entered the data for

one district and then crossed checked for each other the data entry individually to ensure there were no errors. Descriptive statistics – frequencies, percentages, and medians were used to analyse the data. Kolmogorov-Smirnov test was used to test the normality of the data because the sample size was larger than 50. Since the data was not normally distributed, Independent-sample Mann-Whitney U tests and Kruskal-Wallis tests were used to show the differences in pharmacist's knowledge and practice regarding antibiotic resistance. Statistically significant difference was established with P-value <0.05. Incomplete questionnaires were not included in the analysis. As there were only two optional and specific open-ended questions, our content analysis included compiling a 1st list of all the counselling points reported and a 2nd list for all the recommendations or practices to reduce antibiotic resistance. Recurrent/repetitive responses were then grouped to form themes and the number of pharmacists reporting the same counselling points or recommendations was recorded.

Ethical approval was obtained from University of Hertfordshire (NO. EC1B) as well as approval from the Ministry of Health in Kuwait (NO. 2096).

RESULTS

Participants characteristic: From a total of 274 pharmacists, 156 responded to the survey, giving a response rate of 57%. Among the respondents, the age group 20-29 years constituted the highest proportion (n=73, 46.8%). The majority were female (n=126, 80.8%). About 44.2 % (n=69) of pharmacists have been practicing in pharmacy less than five years since graduation and about 67% (n=105) of the participants had previously worked in a hospital. Most of the respondents (82.1%, n=128) had a Bachelor of Pharmacy degree (BPharm), with 93 participants (60%) graduates from Kuwait University (Table 1).

Nearly half of the participants (47.4%, n=74) reported that they see 20 antibiotic prescriptions or more daily, with more than 78% further reporting that were not familiar with the term 'Antimicrobial Stewardship' nor did they receive or participate in any further continuous professional development related to antibiotic use and resistance since their undergraduate studies.

Table 1. Demographic of the participating pharmacists.

Demographics	N (%) number of respondents (total of 156)
1- Age (Years)	
20-29	73 (46.8%)
30-39	58 (37.1%)
40-49	10 (6.4%)
50 and older	12 (7.7%)
Not answered	3 (2%)
2-Gender	
Male	28 (17.9%)
Female	126 (80.8%)
Not answered	2 (1.3%)
3-Total years of practice as a pharmacist since graduation	
0-4	69 (44.2%)
>5-10	41 (26.3%)
>10	46 (29.5%)
4-Have you ever practiced in hospital?	
Yes	105 (67.3%)
No	50 (32.1%)
Not answered	1 (0.6%)
5-Education level	
BPharm	128 (82.1%)
MPharm	5 (3.2%)
PharmD	7 (4.5%)
MSc	12 (7.7%)
PhD	2 (1.3%)
Others	2 (1.3%)
6-Graduate from Kuwait University or others	
Kuwait University	93 (59.6%)
Others	62 (39.7%)
Not answered	1(0.6%)

Pharmacists' knowledge about antibiotic resistance: Overall, the results showed that pharmacists who worked in primary care settings in Kuwait had very good knowledge about antibiotic resistance. Majority of the pharmacists strongly agreed/agreed (n=148, 95%) that antibiotics can cause allergic reaction and the misuse of antibiotics can lead to loss of sensitivity of an antibiotic to a specific bacterium (95%, n=148). However, the results demonstrated that about 16.6% (n=26) of pharmacists strongly agreed/agreed that antibiotics are used to reduce any kind of pain and inflammation. Additionally, the study displayed that around 93% (n=145) of pharmacists strongly agreed/agreed that antibiotics are useful for infections caused by bacteria, whereas only 6.4% (n=10) of participants indicated that antibiotics are useful for infections caused by viruses. Contradictory to the responses related to the participants' knowledge about antimicrobial stewardship, about 59% (n=92) of pharmacists strongly agreed/agreed

that this program would help decrease the spread of antibiotic resistance (Table 2).

Pharmacists' practice toward antibiotic resistance: Overall, the results showed that pharmacists in primary care settings in Kuwait had a good practice toward antibiotic resistance (Table 3). Results showed that a high percentage of pharmacists dispense antibiotic with an appropriate prescription (n=137, 87.8%) and contact the physician if they are not sure about the prescription (n=106, 67.9%). Moreover, a large proportion of participants responded that they never dispense antibiotics without a prescription based on patients' appeal (n=126, 80.8%). Additionally, results revealed that only 32% (n= 50) of pharmacists sometimes screen the prescription before dispensing to check if it is complying with local guidelines (Antibiotic's name, the dose, frequency and duration). Around 88 pharmacists (56.4%) reported that they educate patients on the use of antibiotics and the risk of antibiotic resistance.

Open-ended questions: Question 1, "What are the key counselling points that you would talk to patients about when dispensing antibiotics", was answered by 146 pharmacists. About 79.5% (n=116) of pharmacists advised patients to complete the full antibiotic course even if they feel better. Surprisingly only 32 pharmacists stated that they query if the patients had an allergy and only six pharmacists said they would ask female patients if they are pregnant or breastfeeding. Interestingly, four pharmacists reported that they counsel the patients to take probiotics, such as yogurt. Moreover, 20 pharmacists indicated that they inform patients about drug interactions and only two pharmacists said that they would inform the patients that the misuse of antibiotics leads to antibiotic resistance.

Question 2, 'How do you or can you prevent or reduce antibiotic resistance within the community?' was only answered by 67 pharmacists. Results showed that 17 (11%) pharmacists stated that they would educate patients, the general public, and families about the causes of antibiotic resistance. Only seven pharmacists stated that they would not dispense antibiotics without prescriptions. Two pharmacists reported that they have participated in campaigns related to antibiotics topics. One pharmacist indicated that handwashing is important step to reduce antibiotic resistance within community.

Table 2. Pharmacists' knowledge towards antibiotic resistance

In general, I believe that:	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
1 Antibiotics are indicated to reduce any kind of pain and inflammation.	3 (1.9%)	23 (14.7%)	12 (7.7%)	54(34.6%)	63 (40.4 %)
2 Antibiotics can cause secondary infections after killing normal flora present in our body	55 (35.3%)	75 (48.1%)	16 (10.3%)	9 (5.8%)	0
3 Antibiotics can cause allergic reactions	85 (54.5%)	63 (40.4%)	3 (1.9%)	3 (1.9%)	1 (0.6 %)
4 Misuse of antibiotics can lead to loss of sensitivity of an antibiotic to a specific pathogen	112 (71.8 %)	36 (23.1 %)	5 (3.2 %)	1 (0.6 %)	1 (0.6%)
5 If symptoms improve before the full antibiotic course of is completed, you can stop taking it.	3 (1.9%)	4 (2.6 %)	2 (1.3 %)	31 (19.9 %)	115 (73.7 %)
6 Antibiotics are useful for bacterial infections	84 (53.8%)	61 (39.1%)	4 (2.6%)	5 (3.2%)	0
7 Antibiotics are useful for viral infections	2 (1.3%)	8 (5.1%)	6 (3.8%)	34 (21.8%)	105 (67.3%)
8 Antimicrobial stewardship program helps reduce antibiotic resistance	37 (23.7%)	55 (35.3%)	58 (37.2%)	4 (2.6%)	1 (0.6%)

Question 2, 'How do you or can you prevent or reduce antibiotic resistance within the community?' was only answered by 67 pharmacists. Results showed that 17 (25%) pharmacists stated that they would educate patients, the general public, and families about the causes of antibiotic resistance. Only seven pharmacists stated that they would not dispense antibiotics without prescriptions. Two pharmacists reported that they have participated in campaigns related to antibiotics topics. One pharmacist indicated that handwashing is important step to reduce antibiotic resistance within community.

Median scores of participants about their knowledge and practice regarding antibiotic resistance: Mann-Whitney and Kruskal-Wallis tests were used to detect the differences in knowledge and practice among participants. According to the independent-sample Mann-Whitney U tests, gender, years of hospital work experience and the attendance of educational courses about antibiotic resistance showed no statistically significant difference in relation to the pharmacists' knowledge of antibiotic use and their practice within the community pharmacy. However, there was a significant difference between pharmacists that have graduated from Kuwait University in comparison to pharmacists that have graduated from elsewhere in terms of their practice regarding antibiotic resistance ($P < 0.05$). Pharmacists who graduated from other universities had higher scores in practice than Kuwait University graduates. Furthermore, the Kruskal-Wallis test showed that age, total years of practice since graduation and educational level were found to have no statistically

differences in relation to participants' knowledge and practice ($P > 0.05$).

DISCUSSION

The prudent use of antibiotics is an essential approach to conserve the efficacy of them to treat infectious diseases. Pharmacists have a responsibility to take prominent roles to limit or reduce antibiotic resistance in health care systems. This is the first known study to be conducted in Kuwait to comprehensively demonstrate knowledge and practice towards antibiotic resistance among pharmacists in primary care centres. The findings reported in this study provided a first insight regarding the knowledge and practices of primary care pharmacists towards antibiotic resistance in Kuwait. From a total of 274 pharmacists, 156 pharmacists responded to the survey (response rate 57%).

Overall, the study highlighted that most of the practicing pharmacists had up to date knowledge regarding the threat of antibiotic resistance, which is similar outcome to previously published international studies (Chandy et al, 2003; Tafa et al, 2017; Sarwar et al., 2018; Napolitano et al 2019). A recent study in Cairo, Egypt had also reported that approximately half of the participants (51.2% $n=461$) were considered to have good basic knowledge regarding antibiotic use and antibiotic resistance (Zakaa El-Din et al, 2019). These positive findings across different countries perhaps are an indication of the global awareness of the issues relevant to antimicrobial resistance and antibiotic misuse as a global threat as revealed by the

Table 3. Pharmacists' practice towards antibiotic resistance

In general,	Always	Usually	Sometimes	Rarely	Never
1 I dispense antibiotics with an appropriate prescription	105 (67.3%)	32 (20.5%)	13 (8.3%)	2 (1.30%)	2 (1.30%)
2 I dispense antibiotics without a prescription based on patient request	0	1 (0.6%)	6 (3.80%)	21 (13.5%)	126 (80.8%)
3 I dispense antibiotics for duration more than prescribed by the physician on patients' request	3 (1.9%)	3 (1.9%)	11 (7.1%)	25 (16.0%)	112 (71.8%)
4 I screen antibiotics prescription in accordance to local guidelines before dispensing	27 (17.3%)	36 (23.1%)	50 (32.1%)	26 (16.7%)	15 (9.6%)
5 I communicate with prescriber if I am not sure about the appropriateness of an antibiotic prescription.	71 (45.5%)	35 (22.4%)	32 (20.5%)	10 (6.4%)	5 (3.2%)
6 I sought additional clinical information (drug interaction, adverse drug reaction, allergies) before deciding to dispense the antibiotic prescribed	39 (25%)	46 (29.5%)	49 (31.40%)	16 (10.3%)	3 (1.90%)
7 I take part in antimicrobial awareness campaigns to promote use of antibiotics	16 (10.3%)	26 (16.7%)	32 (20.50%)	35 (22.4%)	42 (27.6%)
8 I educate patients on the use of antibiotics and resistance related issues	37 (23.7%)	51 (32.7%)	48 (30.8%)	14 (9.0%)	4 (2.6%)
9 I ask the patients about their knowledge of the prescribed antibiotic and its usage	21 (13.5%)	38 (24.4%)	53 (34.0%)	31 (19.9%)	11 (7.1%)
10 I feel pressure from patients requests to dispense antibiotics without prescription or indication	28 (17.9%)	22 (14.1%)	40 (25.6%)	31 (19.9%)	33 (21.2%)
11 I make efforts to prevent or reduce antibiotic resistance within the community	38 (24.4%)	50 (32.1%)	48 (30.8%)	11 (7.1%)	7 (4.5%)

WHO (2015), that while much activity is underway and many governments are committed to addressing the problem of antibiotic resistance, there are still major gaps in actions needed across all regions.

The results of the study showed that pharmacists in Kuwait had a good knowledge indicating Kuwait's commitment, alongside the other GCC countries, to combat antimicrobial resistance through several initiatives including auditing prescribing and dispensing practices and promoting targeted undergraduate and post-graduate educational programs (Balkhy et al, 2016). Moreover, the social media nowadays has put antibiotic resistance issue in the spotlight.

Surprisingly, only 33 pharmacists (21.2%) reported that they were familiar with the term antimicrobial stewardship program, but around 59% of pharmacists believed that this program helps to reduce antibiotic resistance. A review by Nasr et al (2017) identified that antimicrobial stewardship programmes (AMS) are in their infancy in the Middle East region but that work is currently being done to further develop these programmes. While a review by Algamdi et al (2018) further reported that the adoption of AMS in hospitals

in GCC states remains low and underreported. A scoping review by Jamshed et al (2018) aimed to identify antimicrobial stewardships within the community, however the study focused on reporting perception and attitudes of community pharmacists towards antibiotic dispensing. The review included only 3 studies from the Middle East (from a total of 13 studies), two of which were from Saudi Arabia (Hadi, 2015; Bin Abdulhak, 2011) and one from Jordan (Almaytah, 2015); with all three studies reporting that dispensing antibiotics without a prescription, for various reasons, was not uncommon. However, it is important to acknowledge that these studies have been published over 5 years ago and new initiatives prohibiting the dispensing of antibiotics, particularly in Saudi Arabia, has been implemented in the recent years (Alrasheedy et al, 2019; Kurdi et al, 2020). With the low level of AMS adoption within the healthcare sectors in the Middle East it may be unsurprising that community pharmacists in Kuwait may not be aware of what exactly AMS programmes entail.

There is a strong correlation between pharmacists' knowledge and their practice toward antibiotic resistance as higher pharmacists' knowledge toward this problem might affect their propensity to practice

well when dispensing or counselling patients regarding antibiotics. The strength of this view has been shown in a research conducted by Roque et al (2014) in Russia (Roque et al., 2014). The results illustrated that pharmacists' knowledge could influence their practice when dispense medications in a positive way (Roque et al., 2014).

Most pharmacists in Kuwait claimed that they see 20 antibiotic prescriptions or more every day. The same result was drawn from a study conducted in Lebanon in which most of the pharmacists said that they receive between 10 to 30 antibiotic perceptions per day in both higher and lower socio-economic areas (Farah et al., 2015). The high rate of prescribing in Kuwait could partly be explained by the public's attitude and knowledge towards antibiotic use and the pressure they may exert on physicians to prescribe an antibiotic even when it is not necessary (Awad & Aboud, 2015). It is well recognised in Kuwait that overprescribing by physicians even in the absence of appropriate indications due to diagnostic uncertainty, their lack of knowledge about optimal therapy and patients' pressure are reasons that contribute to increase antibiotic resistance (Aly & Balkhy, 2012). Other possible reasons of over-prescribing of antibiotics are the lack of guidelines, repetitive audits and the absence of continues professional education courses for the physicians to increase their awareness of appropriate prescriptions (Aly et al., 2012).

Dispensing antibiotics without a prescription is a major contributing factor for the inappropriate antibiotic use and subsequently the development of antimicrobial resistance. Recent reviews (Servia-Dopazo & Figueiras, 2018; Batista et al, 2020) have reported the extent of this problem as well as the potential determinants for dispensing antibiotics without a prescription. Two recent systematic reviews within the Middle East have identified several studies in the region reporting the self-medication and self-prescribing for medicines in general (Khalifeh et al, 2017) as well as specific for antibiotics (Alhomoud et al, 2017). A further study from Jordon (Haddadin et al, 2019) reported that from a total of the 457 antibiotics dispensed from the community pharmacy, almost one third were without prescription. One study from Kuwait (Awad & Aboud, 2015) explored the general communities' knowledge, attitude and

practice towards antibiotic use. From a total of 680 respondents, fifty-nine (31.6%) of them who had self-medicated obtained the antibiotics directly from private pharmacies in Kuwait, and from pharmacies abroad (n=20, 10.7%) without a prescription. Other sources of obtaining antibiotics included family members (n = 50, 26.7%) and friends (n = 7; 3.7%). Our study on the other hand has illustrated that around 67.3% of pharmacists always dispense antibiotics with an appropriate medical prescription and about 80.8% of participants never dispense antibiotic without prescription based on patients' demand. It is unclear what the true extend of dispensing antibiotics without a prescription is in Kuwait and so social desirability bias may have influenced the results as it is illegal to dispense an antibiotic without a prescription but patients' demands and the profit interest of the private pharmacies are factors that may lead to inappropriate dispensing of antibiotics without a prescription (Awad & Aboud, 2015).

This research has established that 45.5% of pharmacists contact the prescribing doctor if they were unsure about the appropriateness of an antibiotic prescription. This relatively low percentage may be due to several factors that have been reported in a recent cross-sectional survey conducted among physicians and pharmacists by Albassam et al (2020). An older study by Matowe et al (2006) involving a self-administered questionnaire exploring physicians' perceptions, expectations and experience with hospital-based pharmacists in Kuwait showed that most physicians do not expect pharmacists to have a role in direct patient care. The probable reason for that could be due to the insufficiency of pharmacists' clinical training in Kuwait and lack of confidence in their knowledge, which may adversely affect doctor perception (Matowe et al., 2006). Albassam et al (2020) has further established these findings more than a decade later, but has also identified that although over 98% of physicians and pharmacists in their study agreed that their collaboration improves patient outcomes, more than half of the physicians (52.1%) and pharmacists (55.7%) had never practised collaboratively; and this is consistent with our findings.

Our results were also comparable with the study conducted in Malaysia which showed that

approximately 39% of pharmacists always contacted the doctors if they had doubts about the appropriateness of the prescription before dispensing it (Khan et al., 2016). This poor communication between health care providers surely is a barrier for prudent antibiotic use (Sarwar et al., 2018). Albassam et al (2020) explains that this limited collaborative practice in Kuwait could be partly explained by the lack of official policies on interprofessional collaboration and lack of joint undergraduate training courses for both professions. Other reasons for the limited collaborative practice may be due to the lack of explicit national standards of interprofessional collaborative practice, lack of time, lack of face-to-face communication, and possible fragmentation of patient care by the involvement of multiple healthcare professionals and finally the professional culture of some physicians in which they have traditionally assumed total responsibility for patient outcomes, while being reluctant to involve other healthcare professionals in the clinical decision-making process (Albassam et al, 2020; Berenguer et al, 2004).

Only 27% of pharmacists in this study reported that they participate in antimicrobial awareness campaigns. The first National Campaign for the Proper Use of Antibiotics was conducted and organised by The Directorate of Infection Control in Kuwait in March 2009, under the theme 'Wise use or lose'. The campaign's vision was to rationalise antibiotic use in healthcare settings by 2014 and to encourage this concept through awareness and education of best practices. The campaign targeted doctors, patients and the public in government hospitals (Infection Control Directorate, Kuwait, 2018) but unfortunately pharmacists did not play an active part in this campaign. This highlights the need to encourage pharmacists to participate in antimicrobial awareness initiatives and increase public and professional awareness on the importance of antimicrobial surveillance.

This is the first study to be conducted in Kuwait regarding pharmacists' knowledge and practice toward antibiotic resistance. Using "WhatsApp®" as a mean to disseminate the questionnaire proved to be popular, quick and less resource intensive. However, it is difficult to determine whether the response rate (57%) could have been higher if the questionnaire was

disseminated in person or by other means such as E-mail, post or other social media or whether the results were affected by participation bias. In order to reduce the risk of participation bias and social desirability bias we aimed to ensure participants at the start of the survey that no identifiable data was going to be collected and that all their responses were confidential and anonymous. We also deliberately limited open-ended questions to only two optional questions to simplify and ease the completion of the survey. Our questions were mostly relevant to the pharmacists' daily work and did not involve the need to recall any past information and so the risk of recall bias was minimal. Although Kuwait is small state, and the healthcare system is somewhat standardized across the districts, generalizing the results from our two participating districts across the remaining five should be considered with caution.

There are several implications for practice and policy following the results of this study. Continuous professional development opportunities must be available for community pharmacists. Standards should be set to provide them with the resources and the time to allow them to elevate their knowledge, share and observe good practice and thus gain confidence to play a more active role to combat antimicrobial resistance. Pharmacists' participation in national initiatives for awareness and education of the public is essential and ideal within the remit of their contact with the public. In many cases the community pharmacists may even be first call of contact for healthcare from the public. Antimicrobial stewardship programmes across the healthcare sectors should be supported and expanded by the Ministry of Health. Collaborative work with other healthcare professional, particularly prescribing doctors is necessary and ideally this interprofessional relationship should be harnessed during the undergraduate training of healthcare professionals. Enforcement of fines and strict laws to ban dispensing of antibiotics without a prescription are vital. Future research should investigate pharmacists' as well as pharmacy technicians' knowledge and practice toward antibiotic resistance in other primary care districts and as well as hospitals in Kuwait. In depth interviews would also be useful in exploring the enhancers and barriers for promoting prudent antimicrobial prescribing among the different

healthcare professionals. Auditing prescribing and dispensing practices of antibiotics in hospital as well as the community are also needed to determine the scale of the antibiotic misuse and resistance. Finally evaluating educational programmes and campaigns is vital to determine their effect and impact on public awareness for the global antimicrobial resistance threat.

CONCLUSION

Overall, this study illustrated that pharmacists in primary care centres have an opportunity to help participate in the public's awareness about the emerging threat of antibiotic resistance. Through their knowledge and experience they can work collaboratively with other health care professional to limit antibiotic resistance within Kuwait. There is a need for improvement in continuous professional development as well as communication opportunities between pharmacists and physicians. There are also lost opportunities for the pharmacist to play a much more active role in local antimicrobial awareness campaigns and patient/public education under the support of the Ministry of Health in Kuwait.

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CONFLICT OF INTEREST

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