



Awareness of Antibiotic Misuse and Safety Practices in Saudi Population: A Pilot Study

**Yasmen F. Mahran^{1,2*}, Bashair F. Aldossari³, Basmah I. Bin Huraymil³,
Fay A. Aljumaah³ and Maymunah S. Al-Duwilah³**

¹Department of Pharmaceutical Sciences, Faculty of Pharmacy, Princess Nourah bint Abdulrahman University, Riyadh, Saudi Arabia.

²Department Pharmacology and Toxicology, Faculty of Pharmacy, Ain Shams University, Egypt.

³Faculty of Pharmacy, Prince Sattam Ibn Abdulaziz University, Al-Kharj-Riyadh, Saudi Arabia.

Authors' contributions

This work was carried out in collaboration between all authors. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/JPRI/2018/45974

Editor(s):

(1) Dr. Q. Ping Dou, Professor, Barbara Ann Karmanos Cancer Institute, Departments of Oncology, Pharmacology and Pathology, School of Medicine, Wayne State University, USA.

(2) Dr. Emmanuel Christy Jeyaseelan, Department of Botany, University of Jaffna, Sri Lanka.

Reviewers:

(1) Luciana de Barros Correia Fontes, Universidade Federal de Pernambuco, Brazil.

(2) Pradeep Jadhav, MGM Medical College, India.

Complete Peer review History: <http://www.sciedomain.org/review-history/27928>

Original Research Article

Received 13 October 2018

Accepted 17 December 2018

Published 22 December 2018

ABSTRACT

Aim: To explore the main antibiotic misbehaviors on daily basis, assess the Saudi population awareness with medication safety measures and correlate these factors to gender, age and educational levels.

Study Design: This research is a cross sectional study and the design used a questionnaire survey distributed randomly among public people & health care professional in Al-Riyadh – Al-Kharj, Saudi Arabia, in 2016-2017.

Place and Duration of Study: Sample: were collected from people in Al-Kharj and Al-Riyadh during about two months.

Methodology: We included 413 people (82 men, 331 women; age range 18-61 years) which 334 came from public and 79 from health care professionals. These questionnaires were randomly distributed in Riyadh and Al-Kharj. The collected data were statistically analyzed using Statistical Product and Service Solutions (SPSS) software analysis tool (version 22.0). Chi square test with $p < 0.05$ was used to check for significance of differences in responses.

Results: Results showed that significant percentages of participants were misusing antibiotics due to unawareness or intentional mistakes especially in storage and disposal measures. Moreover, health care professionals declared that most errors were highly related to patient incompliance.
Conclusion: The active participation by health care professionals is fundamental for raising the antibiotic safety measures among the Saudi population and might even be cost effective.

Keywords: Antibiotics; medication safety; patient safety; errors; storage; misuse; self-medication; antibiotic resistance; patient awareness.

ABBREVIATIONS

Antibiotic: It's used to treat or prevent some types of bacterial infection. It works by killing bacteria or preventing them from reproducing and spreading.

Pilot Study: It is a research study conducted before the intended study. It's apply in small scale, preliminary studies which aim to investigate whether crucial components of a main study- usually randomized controlled trial (RCT)- will be feasible.

Mishaps: An unfortunate accident or event.

SA: Saudi Arabia.

sFDA: Saudi Food and Drug Administration.

SPSS: Statistical Product and Service Solutions (SPSS) software analysis tool.

%: Percentage

+Ve: Positive results mean these people answer with YES.

-Ve: Negative results mean these people answer with NO.

1. INTRODUCTION

Antibiotics are considered one of the most effective and heavily prescribed medicines in medical practice with lifesaving properties [1]. However, they are also the subject of intensive overuse and/or misuse; both over-prescription and inappropriate use [2,3]. This has led to the worldwide serious problems, for instance: development of bacterial resistance, increasing the burden of chronic diseases and thus rising costs of health services [4,5]. Inappropriate antibiotic use, storage, sharing prescription drugs, self-medication habits and misuse behaviors are among the contributing factors affecting medication safety, which is essential for the safety of patients (Tawfik & Jabeen, 2013). Medication and patient safety measures are indispensable in any health care system. Medication safety is the design of medication administration strategy to ensure the five rights; right patient, right medication, right dose, right route and right time [6]. While patient safety refers to the sustained, proactive process of identifying and avoiding errors, mishaps and miscommunications that could affect a patient's health [6]. Saudi Food and Drug Authority (SFDA) is the regional regulatory authority that assure the safety, quality and efficacy of medications in Saudi Arabia (SA) (sFDA).

Inappropriate use of antimicrobial drugs is closely related to the knowledge, attitudes and behaviors of the population, as well as the antibiotic prescribing behavior of the healthcare professionals [7]. Improvement of the rational use of antimicrobials is encouraged by the World Health Organization through prescription-only use of antibiotics [8] and through educational measures [9]. Hence, preventing medication errors is a blueprint for change in medication safety [10]. Recent research reports have raised concern about the protocols of administration of various pharmaceuticals including antibiotics that are used in health care systems and their effects on medication and patient safety in order to minimize the index of errors to the lowest [11].

These misuse behaviors are considered a public health issue in many middle-east countries that are similar to Saudi Arabia, geographically and culturally and may lead to serious health complications and even death [12] and [13]. Some studies have discussed the reasons associated with antibiotics overuse. These include: attitudes, beliefs, knowledge of antibiotic use [14] and behaviours [15]. However, detailed information regarding trends in antibiotic consumption and population awareness among different educational levels in Saudi Arabia is very limited [16]. Additionally, Literature data from survey studies on the prevalence of

common Antibiotic errors at home is lacking. To promote adherence to medication and patient safety measures, there is an urgent need to highlight the common malpractices that individuals make during their daily life when using antibiotics in Saudi Arabia. This study aims to explore the main antibiotic misbehaviors on daily basis, assess the Saudi population awareness with medication safety measures and correlate these factors to gender, age and educational levels.

2. MATERIALS AND METHODS

2.1 Materials

Individuals from Saudi Arabia.
Questionnaire made of 42 questions.

2.1.1 Inclusion Criteria

Individuals of both genders
Individuals aged above 18 years

2.1.2 Exclusion Criteria

Uneducated people who could not read or write
Individuals aged less than 18 years

2.2 Methods

This research is a cross sectional study and the design used a questionnaire survey distributed randomly among public people & health care professional in Al-Riyadh – Al-Kharj, Saudi Arabia, in 2016-2017. The questionnaire had multiple questions pertaining to Antibiotics used and self-medication habits. Some of these questions were about the placement of antibiotics stored at home, whether they are prescription or not, completing the antibiotic course, keeping the leftover drugs for future use, understanding instructions given and sharing medications.

A self-designed, validated questionnaire adapted from previous studies was designed (Tawfik & Jabeen, 2013), in both English and Arabic languages. We divided 42 questions into two types; 32 was general for both public people & health care professional and only 10 questions were specialized for health care professionals. The questionnaire was distributed to a sample of 10 participants selected randomly and responses were subjected to a factor analysis. Then, some changes were made to some questions. The content validity was finally assessed by discussion and rating by academics and students. A pilot questionnaire was given

The image shows a screenshot of a questionnaire form. The left side is in Arabic, and the right side is in English. The Arabic text includes the title "المضاد الحيوي "Antibiotic"" and a sub-header "أنت/أنتي المشاركة في البحث الإسطلاحي بعنوان (مدى الوعي والأمان الذاتي عند استخدام المضاد الحيوي لدى السعوديين - Awareness of Antibiotic Misuse and Safety Practices in Saudi Population)". The English text includes the instruction "If you are one of the healthcare practitioners, please answer the following questions: إذا كنت من الطاقم الطبي الرجاء الإجابة على التالي:" and three numbered questions: 31. What's your career?, 32. As you one from healthcare practitioners, you are dispensing the antibiotic drugs at?, and 33. As you one from healthcare professional, you are dispensing the antibiotic drugs at?. The form also includes a section for "Required" information, starting with "1. (What's your gender?)".

Fig. 1. Questionnaire form by using Google survey website

to 10 participants and then re-given to them after 45 days to test reliability and reproducibility. It has been shown an excellent reliable test. The question was varied \ diverse response, 19 questions had a response of yes & no options, 17 questions were by multioptions and 6 questions had open answer response where the participants wrote the answer themselves. Additionally, participants read and agreed about the informed consent before filling the survey.

Both hard copies were randomly distributed among employers and students of Prince Sattam University (aged 18 years and above) after verbal agreement and soft copies of the questionnaire using google survey website (https://docs.google.com/forms/d/e/1FAIpQLScfl_d3jjeFvePuqYNO8jSliM5kBBWbSSr_QrEvmWP0W502Bow/viewform?vc=0&c=0&w=1) were available (Referred to Fig. 1).

2.3 Statistical Analysis

Four hundred and thirteen responses were collected, and data were analyzed using

Statistical Product and Service Solutions (SPSS) software analysis tool (version 22.0). Chi square test with $p < 0.05$ was used to check for significance of differences in responses. Data are represented as percentage of the total participants to each question. Analysis of data and presentation of graphs were performed using Microsoft Excel and GraphPad Prism software version 5 (ISI® software, USA).

3. RESULTS

Total of 32 questions for public and 10 questions for Health care professionals from paper and online versions were filled in Riyadh and Al-Kharj and returned with 413 responses. This study scheduled questionnaire questions with their responses which compared with age, gender and work level of participants. General questions responses were classified into different parameters; safety, awareness & education, prescription & storage. Health care professional questions were shown in 3 parameters; Education of patient, writing a prescription and problems they faced during antibiotic dispensing.

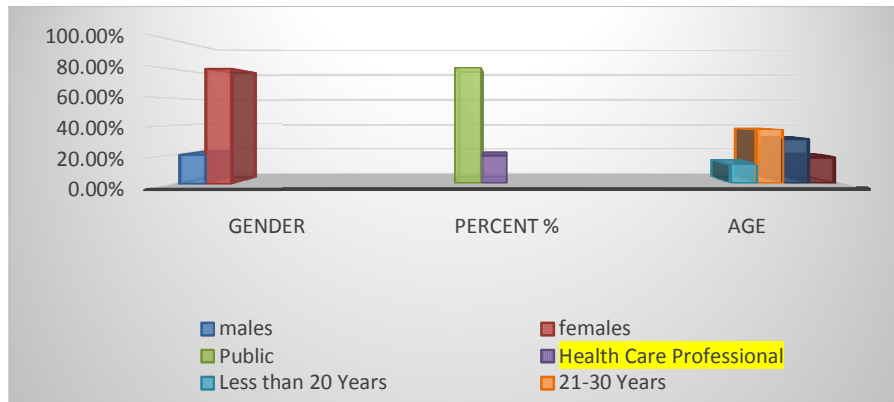


Fig. 2. Study populations divided into different categories



Fig. 3. The most common diseases or medical illnesses for which antibiotics have been used

Table 1. Saudi populations' safety measures when using antibiotics

Practice of antibiotic safety measures	% (+ve)	P-value
1. Use antibiotic by prescription.	79.7%	0.705
2. Use of antibiotic only in case of illness.	99.3	0.043
3. Are you committed to take the antibiotic doses accurate in time?	81.4%	0
4. Do you check for an antibiotic expired date before use?	63.7%	0.006
5. Do you know how to remove or eliminate the remaining of antibiotic?	7.3%	0.001
6. Have you ever been checked the pamphlet comes with the antibiotic drug?	81.6%	0
7. Is antibiotic present at your home as frequency?	60.8%	0
8. Do you have any allergy or side effects once you use antibiotic?	79.9%	0.75
9. Have you ever been poisoned with an antibiotic?	98.5%	0.225
10. Have you ever use an overdose of antibiotic?	93.2%	0.501
11. Have you ever used an antibiotic from the last prescription drugs at your home?	65.4%	0.071
12. Do you mix an antibiotic with milk for your child?	95.2%	0.09
13. Do you dissolve or crush the antibiotic tablet/capsule and mix it with food or syrup to mask its taste?	94.2%	0.02
14. If you are pregnant or feed your baby, do you take antibiotic?	87.4%	0.629
The result of Antibiotic safety	76.57% (+) While	(-) result is 23.43%

Table 2. Practices of antibiotic safety measures according to age

Practice of antibiotic safety measures according to age	% (+ve)				P value
	<20 Y	20-30Y	30-40Y	<40	
1. Use antibiotic by prescription.	81.8%	76.80%	82%	80%	0.043
2. Use of antibiotic only in case of illness.	96.4%	100%	99.20%	100%	0
3. Are you committed to take the antibiotic doses accurate in time?	67.3%	76.1%	88.3%	90.7%	0.006
4. Do you check for an antibiotic expired date before use?	47.3%	60.6%	67.2%	76%	0.001
5. Do you know how to remove or eliminate the remaining of antibiotic?	7.3%	9%	7.8%	2.7%	0
6. Have you ever been checked the pamphlet comes with the antibiotic drug?	49.1%	83.9%	88.3%	89.3%	0
7. Is antibiotic present at your home as frequency?	36.4%	58.1%	65.6%	76%	0.75
8. Do you have any allergy or side effects once you use antibiotic?	87.3%	85.2%	71.9%	77.3%	0.225
9. Have you ever been poisoned with an antibiotic?	98.2%	99.4%	96.9%	100%	0.501
10. Have you ever use an overdose of antibiotic?	89.1%	94.8%	93.8%	92%	0.071
11. Have you ever used an antibiotic from the last prescription drugs at your home?	50.9%	64.5%	69.5%	70.7%	0.09
12. Do you mix an antibiotic with milk for your child?	92.5%	97.1%	92.1%	98.6%	0.02
13. Do you dissolve or crush the antibiotic tablet/capsule and mix it with food or syrup to mask its taste?	85.5%	94.2%	96.1%	97.3%	0.629
14. If you are pregnant or feed your baby, do you take antibiotic?	87.9%	87%	85.2%	91.7%	0.705
Average	69.78%	77.62%	78.85%	81.59%	

Table 3. Practices of antibiotic safety measures according to gender

Practice of antibiotic safety measures according to gender		% (+ve)		P value
		Male	Female	
1.	Use antibiotic by prescription.	67.1%	82.8%	0.002
2.	Use of antibiotic only in case of illness.	96.3%	100%	0.008
3.	Are you committed to take the antibiotic doses accurate in time?	82.9%	81%	0.683
4.	Do you check for an antibiotic expired date before use?	65.9%	63.1%	0.648
5.	Do you know how to remove or eliminate the remaining of antibiotic?	9.8%	6.6%	0.004
6.	Have you ever been check the pamphlet comes with the antibiotic drug?	81.7%	81.6%	0.977
7.	Is antibiotic present at your home as frequency?	59.8%	61%	0.833
8.	Do you have any allergy or side effects once you use an antibiotic?	85.4%	78.5%	0.168
9.	Have you ever been poisoned with antibiotic?	100%	98.2%	0.263
10.	Have you ever use an overdose of antibiotic?	95.1%	92.7%	0.444
11.	Have you ever used an antibiotic from the last prescription drugs at your home?	53.7%	68.3%	0.013
12.	Do you mix an antibiotic with milk for your child?	93.9%	95.5%	0.387
13.	Do you dissolve or crush the antibiotic tablet/capsule and mix it with food or syrup to mask its taste?	95.1%	94%	0.464
14.	If you are pregnant or feed your baby, do you take antibiotic?	90.2%	86.8%	0.977
Average		76.92%	77.86%	

Table 4. Saudi population's awareness & education measure when using antibiotics

Practice of antibiotic Awareness & education measures		(+Ve) %	P-value	
			Age	Gender
1.	Do you think that the different dosage forms of antibiotic affect their efficacies (capsule / syrup/ injection ...Etc.)?	48.9%	0.006	0.825
2.	Do you know that overuse/ misuse of antibiotic will decrease its effect?	66.1%	0.002	0.322
3.	When you take the antibiotic, it works to kill / inhibit the Bacteria?	40%	0	<0.0001
4.	Do you think that the higher antibiotic dose the faster to cure?	86.7%	0.005	0.45
The result of antibiotic awareness & education is		60.42% (+) While (-) result is 39.57%		

Table 5. Saudi population's prescription measure when using antibiotics

Practice of pharmaceuticals antibiotic Prescription measures		(+ve) %	P-value	
			Age	Gender
1.	Do you use antibiotic drugs by Prescription?	79.7%	0.705	0.002
2.	Do you use the antibiotic prescribed by your physician?	92.3%	0.344	0.122
3.	Do you use the full course of antibiotic prescribed by the physician?	55.6%	0.003	0.743
4.	Have you ever use an antibiotic of the last prescription drugs at your home?	65.4%	0.071	0.013
The result is		73.25% (+) While (-) result is 26.75%		

Table 6. Saudi population's storage and disposal measure when using antibiotic

Practice of Antibiotic storage and disposal measures	(+Ve) %	P-value	
		Age	Gender
1. Do you know how to storage Antibiotic drugs?	25.7%	0	0.216
2. Do you know how to eliminate or disposal the remaining antibiotic?	7.3%	0.001	0.004
The result is	16.5%(+) While (-) result is 83.5%		

Table 7. Prescription writing: The role of healthcare professionals

Items	(+Ve) %	P-value	
		Age	Gender
1. Dispensing of the antibiotic drugs at illnesses case only.	89.8%	0.936	0.001
2. Dispensing of the antibiotic power/ strength according to the patient's condition (need).	75.64%	0.979	0.489
3. If your patient has some problems with his/her memory such as (Alzheimer), are you give both the patient and his/her family responsibility to follow the prescription.	21.5%	0.808	0.431
4. Are your favorite methods to treat the patient by Give him one antibiotic drug only?	84.81%	0.977	0.366
5. Do you dispense the antibiotic drugs for simple symptoms such as fever, toothache...?	81.57%	0.2	0.758
The result is	70.66% (+) While (-) result is 29.3%		

Table 8. Patient education: The role of healthcare professionals

Items	%	P-value	
		Age	Gender
1. Do you explain to patient, the drug will become effective and relief the symptoms after how much time?	67.1%	0.383	0.298
2. Do you clarify to patients the side effects which may face from their antibiotic drugs?	64.47%	0.714	0.76
The result	65.79% (+) While (-) result is 34.2%		

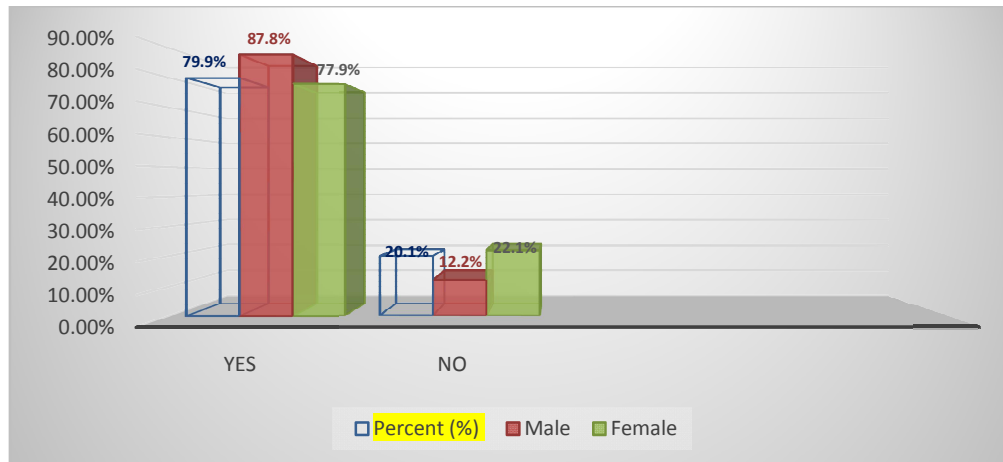


Fig. 4. Variation of population according to which prefer natural materials (Like: Honey/ Garlic/ Lemon...Etc.) over drugs for different gender

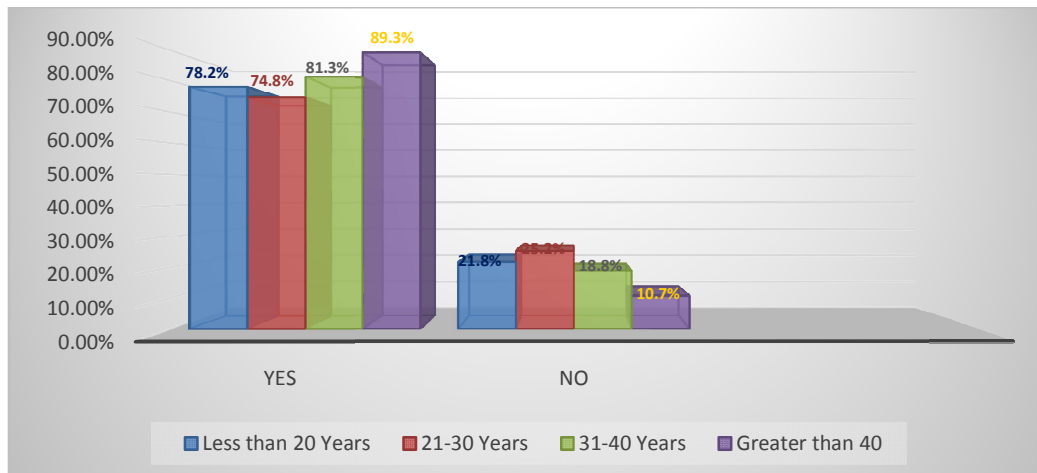


Fig. 5. Variation of population according to which prefer natural materials (Like: Honey/ Garlic/ Lemon...Etc.) over drugs for different ages

Four hundred and thirteen questionnaires from paper and online versions were filled with a response rate over 80 %. From those, 334 came from public and 79 from health care professionals. There were 82 males and 331 Females. Of those, 206 were students, 128 lecturers and employers, 70 were pharmacists, 4 nurses, 4 doctors and one surgical technician (Referred to Fig. 2). Our study showed that there are significant variations between participants of different gender, age and work level have been found upon comparison of their daily practices such as awareness of safety measures, prescription, storage etc.) when using Antibiotic (Referred to Table 1- 6). In addition, this study shows a wide variation in Saudi population in antibiotic use for different medical

illness (Referred to Fig. 3) and variation among them in their preferable choice between natural products (such as: Honey/ Garlic/ Lemon...Etc.) or synthetic drugs among different ages and genders (Referred to Figs. 4 &5).

Antibiotic good practices have been noticed from populations in both Public and Health care professional with significant differences in certain responses from each one Saudi populations' safety measures when using antibiotic is 76.57% of good safety measures while 23.43% were of Low level (Referred to Table 1). Moreover, significant variations were found among participants of different ages when using antibiotics. In the population above forty, about 81.6% of responses were positive while only

69.7% of responses were positive in below twenties population and the intermediate age range showed around 78% positive responses (Referred to Table 2).

On a gender basis, females were found to be notably more aware with safety measures than males when dealing with antibiotics (Referred to Table 3).

Interestingly, our results concerning Saudi population's awareness with antibiotic action and prescription was surprising and promising, as an average of 69.2 % of the population showed positive responses towards some scientific information about the dosage forms and the mechanism of drug action and resistance while only 30.8% of the population failed to respond well. Moreover, about 80 % of Saudi population use antibiotics only when prescribed while 65% use the antibiotic through self-medication concept from a previous prescription. This study highlighted one of the main concerns in antibiotic resistance which is the patient compliance, since 55.6% of the Saudi population didn't complete the full course of antibiotic prescribed by the physician due to unawareness or intentional mistakes (Referred to Tables 4 and 5). Thus, increasing population awareness about optimum dose regimen would minimize the adverse effects, resistance and may even cost effective. On the other hand, this study showed that only 16.5% of Saudi population were aware with storage and disposal measures while using antibiotics is (Very Low Level) and 83.5% of the population were lacking this knowledge (Referred to Table 6). Thus, active participation by

healthcare professionals is fundamental for raising the antibiotic safety measures.

Besides results coming from Saudi public population, this study explored the antibiotic's safety measures and misbehaviors with connection to healthcare professionals who are closely concerned with antibiotics through many ways such as; prescription writing, patient education and monitoring of effective dosage regimen as well as possible adverse effects. It has been shown that 71.3 % of Saudi healthcare professionals strongly followed the prescription writing's measures as well as patient education measures when using antibiotics while only 28.6 % of them showed negative responses. On the other hand, 81.5 % of professionals dispense the antibiotic drugs for simple symptoms such as fever, toothache.... etc. Generally, 68.22% have High effective role in patient education when dealing with antibiotics (Referred to Tables 7 & 8). Furthermore, this study stress on the role of healthcare professionals in educating patients of memory illness, as only 21.5% respond positively when they have been asked if they gave the same instructions to both patients and his family members in case of memory illness such as (Alzheimer) (Referred to Table 7).

Finally, healthcare professionals declared that most errors accompanying with antibiotics were highly related to patient incompliance as patients discontinue the antibiotic once they feel better. Besides, they claimed that patients sometimes asked physician to write an antibiotic because their belief of that antibiotics could treat all types of diseases. On the other hand, this study

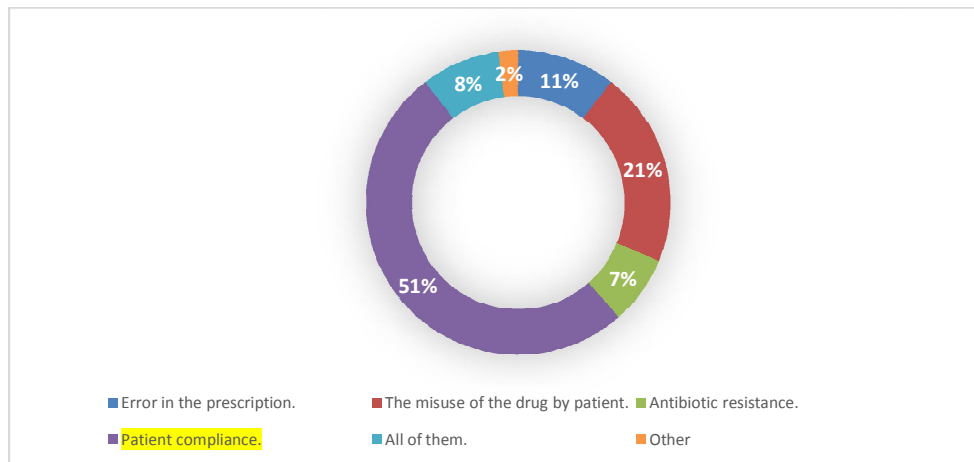


Fig. 6. The most errors associated with antibiotic drug administration

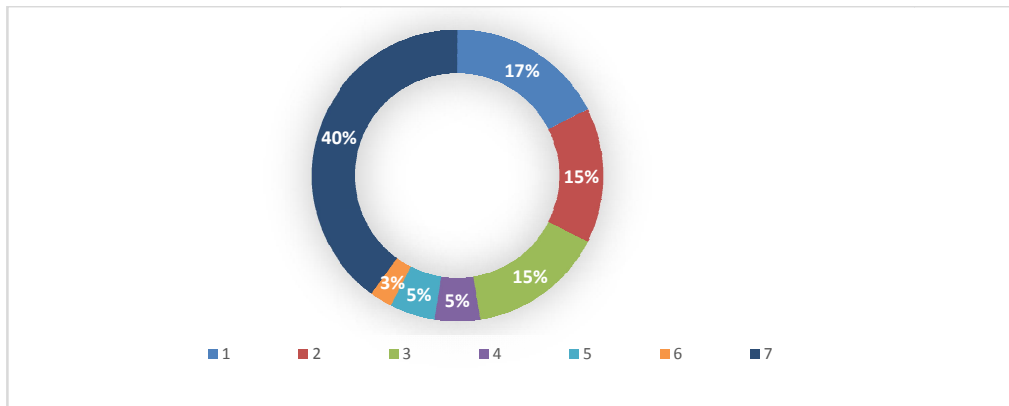


Fig. 7. The common problems face health care professionals when dealing with antibiotics

1. Patients ask physicians to write Antibiotic in cases, even these cases don't require it.
2. Side effect of Antibiotic.
3. Multiple doses & Frequency.
4. Resistance of Antibiotic.
5. Difficult to swallow (Tablet/capsule).
6. Discontinue the taking of antibiotic once they feel better / fine.
7. Many physicians prescribe antibiotics with high doses which increases the chances of adverse effects.

Table 9. The average results of the role of health care professionals in writing prescription and patient education

The final result of prescription and education of patient by a healthcare professional is	Positive role	Negative role
	68.22% of the population has High effective role.	31.75% of the population has Little effective role.

showed that 40 % of responses clarified that physicians write prescriptions with high doses of antibiotics, which increase the chance of adverse effects and affect patient safety (Referred to Figs. 6 & 7).

4. DISCUSSION

Comparison of the safety measures practiced by the study participants when using antibiotics has been done on the basis of prescription, awareness & education, storage and disposal according to three factors gender, age and work category. The study asked about all antibiotics' that people were used in their daily life including prescription and nonprescription selecting people from different work category would significantly help in understanding some of the leading factors to antibiotics safety practices, especially within the Saudi community where there are many challenges to health care services although their governments have given high priority to the development of health care systems. On the other hand, comparing participants of both genders and ages determined how those factors would affect their safety measures when using antibiotics and hence their health. Our findings

were closely related to a previous comparative pilot study had been done in Saudi population by Tawfik and Jabeen (Tawfik & Jabeen, 2013). Analysis of the data revealed that females were found to be notably more aware with safety measures than males when dealing with Antibiotics.

Through the questionnaire, we divided the questions into three parts: first is Awareness and education, second Prescription and third Storage and disposal. Through the mentioned percentages in the results section (Referred to Tables 3,4,5 & 6,) we find that the Saudi society is a conscious and a well-educated society, especially in the age group between 31-40, and this also gives an indication of the role of the medical staff and pharmacists in directing information to patients. The major problem we got is the lack of awareness in Saudi society regarding the correct way of antibiotic Storage and disposal. Indeed, self-prescribing is acceptable in some situations for physicians, but in the case of antibiotics they should seek professional help for illness. This study showed that about 65.4% of the population use the antibiotic through self-medication from a previous

prescription, which is a high percent (Referred to Table 5). Our study confirms the findings of high prevalence of self-medication among educated subjects in other countries [7,17].

Besides public population, part of the questionnaire was developed to measure the role of the health care professionals during the use of antibiotic such as; writing of prescription and patient education. This study showed that about 68.22% of Saudi health care professionals have a high effective role in patient education who are on antibiotics and only 31.75 % were of little role (Referred to Table 9). Through this ratio, we find that the role of the medical staff is very effective in building up patient's awareness and guiding them through the right way during antibiotic therapy. Unfortunately, all these efforts are being not sufficient and Health care professionals need to work harder to make higher in order to increase the level of safety and awareness in a well civilized population like Saudi one. Indeed, our study showed a high prevalence of medical errors and antibiotic resistances are associated mainly with patient incompliance, as they did not complete the antibiotic course. Subjects from the general population are not always aware about the importance of compliance in the case of antibiotic treatment of the correct use of antibiotics and are sometimes confused [18,19], therefore educational programs should be instated to inform about the harm produced by administering antibiotics in the most common viral infections. It is essential to increase the awareness of the importance for correct use of antibiotics, not using antibiotics in common viral diseases, both by healthcare professionals and the general population [7,20].

5. CONCLUSION

With the context of the main aim of this study, our paper was the first to conclude that females have more awareness of the safety measures than males when dealing with Antibiotics. In addition, we suggest that the major problem in Saudi society is the lack of awareness of the correct way of antibiotic storage and disposal. Moreover, self-medication and patient incompliance are considered the main problems beyond the antibiotic misuse as claimed by health care professionals. Therefore, active participation by health care professionals is fundamental for increasing Saudi population awareness about optimum dose regimen which would minimize the adverse effects and

resistances, raise the antibiotic safety measures and might even be cost effective.

CONSENT

Participants read and agreed about the informed consent before filling the survey.

ETHICAL APPROVAL

As per international standard or university standard written ethical approval has been collected and preserved by the author(s).

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Buke AC, Ermertcan S, Hosgor-Limoncu M, Ciceklioglu M, Eren S. Rational antibiotic use and academic staff: An Evidence-Based Int. J. Antimicrob Agents, Buke AC, ed. 2003;21:63-66.
2. Gyssens IC. Quality measures of antimicrobial drug use: An Evidence-Based Int. J. Antimicrob Agents, Gyssens IC, ed. 2001;17:9-19.
3. Shehadeh M, Suaifan G, Darwish RM, Wazaify M, Zaru L, Alja'fari S. Knowledge, attitudes and behavior regarding antibiotics use and misuse among adults in the community of Jordan. A pilot study: An Evidence-Based Journal, Saudi Pharmaceutical Journal, Shehadeh M, ed. 2012;4:125-133.
4. Mora Y, Avila-Agtiero M, Umafia M, Jimenez A, Paris M. Faingezicht I. Epidemiologic observations of the judicious use of antibiotics in a pediatric teaching hospital: An evidence-based. Int J Infect Dis, Mora Y, ed. 2002;6:74-77.
5. Sorkhou I, Al-Qallaf B, Hajiah A, Al-Sheibani H, Bayoomi A, Mustafa A. Perceptions of patients attending primary care in Kuwait regarding upper respiratory tract infections: An evidence-based Kuwait medical Journal, Sorkhou I, ed. 2002;34: 272-275.
6. Hughes RG, Blegen MA. Patient safety and quality: An evidence-based handbook for nurses, medication administration safety, Ch37, Hughes RG, ed. 2008;2: 397-457.

7. Gualano MR, Gili R, Scaioli G, Bert F, Siliquini R. General population's knowledge and attitudes about antibiotics: A systematic review and meta-analysis: An Evidence-Based Pharmacoeconomics and Drug Safety, Gualano MR, ed. 2015;24(1):2-10 .
8. Leung E, Weil DE, Raviglione M, Nakatani H. World Health Organization World Health Day Antimicrobial Resistance Technical Working Group. The WHO policy package to combat antimicrobial resistance: An Evidence-Based Bulletin of the World Health Organization, Leung E, ed. 2011;89(5):390-392.
9. Lee CR, Lee JH, Kang LW, Jeong BC, Lee SH. Educational effectiveness, target, and content for prudent antibiotic use: An Evidence-Based BioMed Research International, Lee CR, ed. 2015; Article ID 214021, 13 pages.
10. Bates DW. Preventing medication errors: A summary: An evidence-based. American Journal of Health-System Pharmacy, Bates DW, ed. 2007;64(14):s3-s9.
11. Hesselgreaves H, Watson A, Crawford A, Lough M, Bowie P. Medication safety: using incident data analysis and clinical focus groups to inform educational needs: An Evidence-Based Journal of evaluation in Clinical Practice, Hesselgreaves H, ed. 2013;19(1):30-38.
<http://www.sfda.gov.sa-->
http://www.usp.org/sites/default/files/usp_pdf/EN/members/patientSafety.pdf
<http://www.who.int/mediacentre/factsheets/fs293/en/>
12. Bawazir S. Prescribing pattern at Community Pharmacies in Saudi Arabia: An Evidence-Based Int Pharm J, Bawazir S, ed. 1992;6:222-224.
13. Sarahroodi S, Arzi A, Sawalha A, Ashtarinezhad A. Antibiotics self-medication among southern Iranian university students: An evidence-based. Int J Pharmacol, Sarahroodi S, ed. 2010;6: 48-52.
14. Chan G, Tang S. Parental knowledge, attitudes and antibiotic use for acute upper respiratory tract infection in children attending a primary healthcare clinic in Malaysia: An evidence-based. Singapore Med J, Chan G, ed. 2006;47:266-270.
15. Al-Azzam S, Al-Husein B, Alzoubi F, Masadeh M, Al-Horani M. Self-medication with antibiotics in Jordanian population: An Evidence-Based IJOMEH, Al-Azzam S, ed. 2007;20:373-380.
16. Alumran A, Hou XY, Hurst C. Assessing the overuse of antibiotics in children with URTIs in Saudi Arabia: Development of the parental perception on antibiotics scale (PAPA scale): An Evidence-Based J Epidemiol Glob Health, Alumran A, ed. 2013;3(1):3-10.
17. Vallin M, Polyzoi M, Marrone G, Rosales-Klantz S, Tegmark Wisell K, Stålsby Lundborg C. Knowledge and attitudes towards antibiotic use and resistance— a latent class analysis of a Swedish population-based sample. PLOS ONE. 2016;11(4):e0152160.
18. Gonzalez-Gonzalez C, López-Vázquez P, Vázquez-Lago JM, Piñeiro Lamas M, Herdeiro MT, Arzamendi PC, Figueiras A, GREPHEPI Group. Effect of physicians' attitudes and knowledge on the quality of antibiotic prescription: A cohort study. PLOS ONE. 2015;10(10): e0141820.
19. Zoorob R, Grigoryan L, Nash S, Trautner BW. Nonprescription antimicrobial use in a primary care population in the United States. Antimicrobial Agents and Chemotherapy. 2016;60(9):5527-5532.
20. Lv B, Zhou Z, Xu G, Yang D, Wu L, Shen Q, Jiang M, Wang X, Zhao G, Yang S, Fang Y. Knowledge, attitudes and practices concerning self-medication with antibiotics among university students in western China. Tropical Medicine & International Health. 2014;19(7):769-779.

© 2018 Mahrn et al.; This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Peer-review history:
The peer review history for this paper can be accessed here:
<http://www.sciencedomain.org/review-history/27928>