



Antimicrobial-stewardship Knowledge, attitude, and practice among professional physicians in Saudi hospitals

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ABSTRACT

Antimicrobial stewardship (AMS) is of vital significance to tackle the antibiotic resistance. Insights of physicians is important for implementation of AMS. Therefore, present study was conducted to assess the knowledge, attitude and practices regarding antibiotic stewardship programme among professional physicians in Riyadh, Saudi Arabia. A cross-sectional questionnaire-based survey was conducted among professional physicians between January 2020 to April 2020 in clusters of Saudi hospitals. The self-administered and closed ended questionnaire encompassed of informed consent, demographics information and questionnaire which included 7 items for knowledge, 10 for attitude and 8 for practices. Chi-square test and Fisher's exact test was performed to assess the relationship of knowledge, attitude and practices with gender and medical specialty of the study participants along with descriptive statistics. A p value below ($p < 0.05$) was considered significant for all the statistical purposes. A total of 413 medical practitioners participated in this study. Most of the participants were male 280 (67.8%), aged 31-40 years 163 (39.4%). The term antimicrobial stewardship was known to 55.9% of participants and 65% of participants knew the difference between bacteriostatic and bactericidal antimicrobial agents (AMAs). 71.9% participants opined that superinfections can be prevented by using specific AMAs. 89% of participants do not prescribe AMAs on demand of patients. Health professionals should be adequately trained regarding usage of antimicrobials and their consequences to curb the menace of quickly developing AMA resistance.



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INTRODUCTION

Inapt prescribing practices by clinicians have been regarded as a principal causal aspect for antibiotic

resistance, which is now are cognized menace to world health (Wasserman *et al.*, 2017). Insufficient training and lack of admiration of the degree and repercussion of ABR might be a basis for such inappropriate prescription. Thus, it becomes crucial to endow clinicians with the essential confidence and proficiency from the initial period in their professional life on apposite antibiotic prescribing, (Ohl and Luther, 2014) and alteration of insights and persistent behaviour change through execution of interventions focusing on appreciation of the causes resulting in antimicrobial resistance (Wasserman *et al.*, 2017), (Charani *et al.*, 2014). Even though lectures of pharmacology and microbiology are incorporated in medical education formally, failure to convert this into clinical prescribing pattern has been noticed \$. Previous surveys revealed that

Table 1: Characteristics of the study participants (n=413)

Characteristics		n	%
Age (Years)	21-30	88	21.3%
	31-40	163	39.4%
	41-50	120	29.1%
	≥51	42	10.2%
Gender	Male	280	67.8%
	Female	133	32.2%
Experience years	0-10	204	49.4%
	11-20	131	31.8%
	21-30	39	9.4%
	31-40	39	9.4%
Work region	Central	180	43.6%
	Western	102	24.7%
	Northern	42	10.2%
	Eastern	48	11.6%
	Southern	41	9.9%
Medical specialty	Other	39	9.4%
	Gynecology	12	2.9%
	Pediatrics	58	14.0%
	Dermatology	17	4.1%
	Ophthalmology	12	2.9%
	Orthopedics	17	4.1%
	Medicine	190	46.0%
	Surgery	68	16.6%

medical students in spite of being acquainted with the significance of antibiotic prescribing awareness, consider themselves efficiently primed and want additional education on choosing antibiotic (Scaiola *et al.*, 2015), (Dyar *et al.*, 2014).

Antimicrobial stewardship (AMS) is of vital significance to lessen hospital-acquired infection and deal with the crisis of multi-resistant bacteria. It intervenes for improving prescribing patterns at personal and institutional levels (Wasserman *et al.*, 2017). To tackle antimicrobial resistance, every country ought to execute a comprehensive strategy for AMS (Gillespie *et al.*, 2013). The utilization of the most appropriate antibiotic for the presenting clinical situation and the particular patient is promoted by AMS (Buckel *et al.*, 2016). It is an integrated approach which ensures appropriate antimicrobial agents (AMAs) usage by advocating the selection of drug regime with proper dose and duration along with a suitable route of administration. Through these measures, the possibility of toxicity is diminished, the cost-effectiveness of treatment is enhanced, and the option for antimicrobial-resistant strains is limited (Taneja and Kaur, 2017), (Vandana Badar *et al.*, 2018).

In Saudi Arabia, the national AMS program set in motion in 2014, is a component of the pharmacy strategic plan of the Ministry of Health, and its complete execution has been achieved in 2018 (Alomi, 2015), (Alomi, 2017). Relatively few studies of knowledge, attitude, and practice are published about antimicrobial-stewardship concerning microbial resistance in Saudi Arabia (Baraka *et al.*, 2019), (Al-Harathi *et al.*, 2015). It was therefore found appropriate to assess the knowledge, attitude and practices regarding antibiotic stewardship programme among professional physicians in Riyadh, Saudi Arabia.

MATERIALS AND METHODS

A cross-sectional questionnaire-based survey was conducted among professional physicians to evaluate their knowledge, attitude and practice towards Antimicrobial stewardship program in Saudi hospitals. The study was conducted between January 2020 to April 2020 in clusters of Saudi hospitals. The ethical committee obtained approval before proceeding with the research, and informed consent

Table 2: Knowledge of study participants towards Antimicrobial agents

Item	Knowledge	Responses	n	%	Gender (p value)	Medical specialty (p value)
K1	The difference between bacteriostatic and bactericidal Antimicrobial agents	Yes	264	65.0%	0.439	.000
		No	142	35.0%		
K2	The difference between broad spectrum and narrow spectrum antimicrobials?	Yes	401	98.8%	0.562	0.332
		No	5	1.2%		
K3	Do you know the term antimicrobial stewardship?	Yes	227	55.9%	.002	<0.001
		No	179	44.1%		
K4	Mechanisms are for drug resistance	Increased entry of antibiotic into pathogen	82	19.9%	.001	.460
		Decreased export by efflux pumps	114	27.6%	0.439	<0.001
		Alteration of target proteins	239	57.9%	0.134	<0.001
		Release of microbial enzymes that destroy the antibiotic	157	38.0%	0.596	.007
K5	Factors responsible for emergence of consequences for drug resistance.	Drug-resistant pathogen	328	79.4%	0.380	.049
		Toxicity to the patient	61	14.8%	.049	.003
		Requirement of higher AMA	40	9.7%	0.966	.038
		Fetal damage	69	16.7%	0.730	.142
K6	Drugs used to treat gram negative anaerobes.	Metronidazole	236	57.1%	0.831	<0.001
		Fluoroquinolones	157	38.0%	0.735	<0.001
		Imipenem	229	55.4%	0.266	.001
		Cotrimoxazole	20	4.8%	0.784	.445
K7	Regarding storage of AMAs, which is/are correct	Short expiry medicines should be kept at back	53	13.2%	0.053	.008
		Cool storage means refrigeration	177	43.9%		
		Most antibiotics need temperature of 15-20°C	113	28.0%		
		Storage should be according to brand name	60	14.9%		

For items K4, K5 and K6 only "YES" responses displayed

Table 3: Attitude of study participants towards Antimicrobial agents

Items	Attitude domain items	Responses	N	%	Gender (p value)	Medical specialty (p value)
A1	What precautions do you take to prevent AMA resistance?	Use of AMAs when necessary after AST	342	85.3	0.232	0.051
		Using > 1 AMAs at a time	10	2.5		
		Using newer AMAs for long duration	7	1.7		
		Use of broad spectrum AMAs for mild short-term illness	42	10.5		
A2	Which criteria do you use for selection of AMAs?	Clinical judgement	120	29.1	.008	.008
		Empirical therapy	140	33.9	<0.001	0.36
		Clinical and experimental evidence	264	63.9	0.37	.050
A3	What is/are the basis of choosing a proper dosing schedule?	Lucrative practices	4	1.0	.444	.917
		As per Pharmacokinetic variability	309	74.8	0.114	.329a
		Integrating microbial PK-PD studies	101	24.5	0.113	0.026
		As per minimum inhibitory concentration of pathogen	53	12.8	.026	0.282
A4	How frequently you follow the control suggestions given by Hospital Infection Committee (HICC) or antimicrobial stewardship team?	According to post-antibiotic effect	19	4.6	0.287	0.06
		Always	216	53.9	.018	<0.001
		Often	132	32.9		
		Sometimes	52	13.0		
A5	When do you use empirical therapy?	Seldom or never	1	0.2		
		Life-threatening infection	310	75.1	<0.001	<0.001
		Recurrent local wound infection	30	7.3	0.891	.012
		Community acquired infections	48	11.6	.005	<0.001
		Failure to respond to initial therapy	78	18.9	.006	.002
		To accelerate rapidity of microbial activity	243	58.8	0.097	<0.001
		To enhance therapeutic efficacy	248	60.0	0.853	0.120

Continued on next page

Table 3 continued

Items	Attitude domain items	Responses	N	%	Gender (p value)	Medical specialty (p value)
		To prevent resistance to monotherapy	100	24.2	<0.001	<0.001
		To reduce severity or incidence of ADR	9	2.2	0.891	.012
A6	Does risk of ADR increase with post-treatment suppressive therapy (secondary prophylaxis)?	Yes	309	77.1	0.355	<0.001
		No	92	22.9		
A7	When do you prescribe a secondary antimicrobial (excluding No option from each responses) prophylaxis?	For all surgical patients	178	43.1	.009	<0.001
		For all AIDS patients	279	67.6	.012	<0.001
		For all post-transplant patients	232	56.2	.009	<0.001
		For all patients with major disease	72	17.4	0.107	0.356
A8	How do you prevent super-infections?	Use of specific AMAs	297	71.9	0.307	.759
		Use of AMAs to treat self-limiting illness	28	6.8	0.092	.270
		Use of narrow spectrum AMAs	199	48.2	0.088	.001
		Use of AMAs for pro-long period	35	8.5	<0.001	.063
A9	Most common reason for misuse of AMAs	Conflicting advertising claims of superiority to newer AMAs	63	15.8	<0.001	<0.001
		Prescribing AMAs without prior antibiotic sensitivity test (AST)	198	49.5		
		Strong clinical suspicion of an infection	113	28.3		
		According to availability of AMAs and following opinion of senior doctors.	26	6.5		

For items A2, A3, A5, A7 and A8 only "YES" responses displayed

was taken from each participant.

An online sample size calculator (Qualtrics) was used to calculate the ideal sample size of the participants from the 30,000 physicians as per the 1439 H health Indicator.

The calculated ideal sample size was 380 participants at a 95% confidence level and 5% margin of error. All physicians who are in close contact with patients' medications and were present during that visit were explained about the purpose of the study and those who willingly provided informed consent participated in the study. Physicians who have no direct responsibilities on prescribing medications or following a patient's drug administration, including administration, radiation and laboratory staff were excluded from the study. A single investigator approached all the doctors working in hospitals.

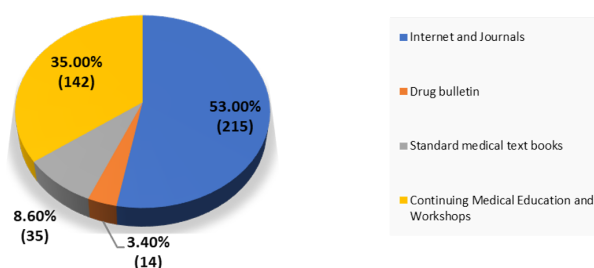


Figure 1: Preferred way of updating the knowledge among study participants

The self-administered and closed-ended questionnaire encompassed of informed consent, demographics information and questionnaire which included 7 items for knowledge, 10 for attitude and 8 for practices. For the item generation of questionnaire expert opinion and previous research carried out by Badar et al. was utilized (Vandana Badar *et al.*, 2018).

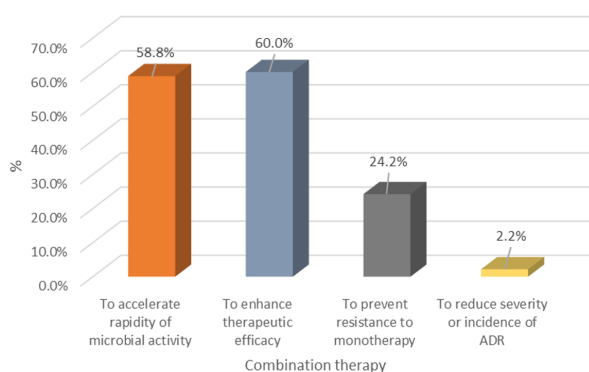


Figure 2: Insist on Combination therapy

Items of knowledge focused on the difference between bacteriostatic and bactericidal AMAs, the difference between narrow and broad-spectrum AMAs etc. The attitude was assessed by topics such

as precautions do you take to prevent AMA resistance?, Which criteria do you use for selection of AMAs?, How frequently you follow the suggestions given by the Hospital Infection Control Committee (HICC) or antimicrobial stewardship team? Practice evaluation items were like. Do you explain to the patient about the use and adverse drug reactions (ADRs) of AMAs? Do you advice simple, rapid lab tests before starting AMA therapy? Ideal duration of surgical prophylaxis (pre, during, post-surgical) that you suggest. All participants responses and answers are presented as Yes/no and multiple-choice questions (MCQs).

The questionnaire was subjected to a pilot study to test for its validity on 20 participants before being distributed to actual participants. The ensuing amendments were done to the questions for the superior understanding of participants. The results and participants of the pilot study were not integrated into the actual survey. The final most version of the questionnaire had Cronbach's alpha and split-half reliability values of 0.83 and 0.79 for knowledge; 0.86 and 0.81 for attitude; and 0.78 and 0.82 for behaviour, respectively.

Statistical analysis

All the responses obtained from the questionnaires were coded and entered into the statistical package for social sciences SPSS (IBM-SPSS version 25, Armonk, NY) and analysis was performed. A descriptive statistics of frequency distribution and percentages were calculated for the characteristics, knowledge, attitude and practices of the study participants. Further, the chi-square test and Fisher's exact test was performed to assess the relationship of knowledge, attitude and practices with gender and medical speciality of the study participants. A p-value below ($p < 0.05$) was considered significant for all the statistical purposes.

RESULTS AND DISCUSSION

The personal characteristics of the study participants are displayed in Tables 1, 2, 3 and 4. A total of $n=413$ medical practitioners participated in this study. Most of the participants were male 280 (67.8%), aged 31-40 years 163(39.4%). Nearly half 204(49.4%) of them having an experience of 0-10 years. Majority of the 180 (43.6%) participants were from the central region and practising medicine speciality 190 (46%). One of the chief factors in the suppression of AMR is by the decline of inconsistent antimicrobial employment and alteration of prescribing behaviour of the clinicians may perhaps bring about this to a considerable extent (Al-Harthi *et al.*, 2015). Unless and until

Table 4: Practice of study participants towards Antimicrobial agents

Items	Practice items	Responses	n	%	Gender (p value)	Medical specialty (p value)
P1	Do you prescribe AMAs on demand of patients?	Yes	44	11.1%	.002	.201
		No	353	88.9%		
P2	Do you explain the patient about use and ADRs of AMAs?	Yes	171	43.1%	<0.001	<0.001
		No	226	56.9%		
P3	Do you advice simple rapid lab tests before starting AMA therapy?	Always	96	24.2%	.002*	.424
		Often	210	52.9%		
		Sometimes	84	21.2%		
		Seldom or Never	7	1.8%		
P4	Do you advice culture-sensitivity in all severe cases if not responding to AMA?	Always	237	59.7%	.953	.419
		Often	116	29.2%		
		Sometimes	41	10.3%		
		Seldom or Never	3	0.8%		
P5	When do you switch from I/V to oral AMAs?	Tachycardia >12 hours or febrile > 24 hours	74	18.6%	<0.001	<0.001
		Clinical improvement	269	67.8%		
		No ongoing problems with absorption	15	3.8%		
		Suitable oral AMA available	39	9.8%		
P6	Average duration of AMA treatment that you prescribe for community-acquired pneumonia is	3-5 days	110	27.7%	.605	.219
		7-14 days	279	70.3%		
		24-28 days	6	1.5%		
		more than 28 days	2	0.5%		
P7	Ideal duration of surgical prophylaxis (pre, during, post-surgical) that you suggest-	1 hour before incision	259	65.2%	.002	<0.001
		> 24 hours after surgery for clean wounds	124	31.2%		
		At the time of ocular surgeries (intra-operational)	9	2.3%		
		12 hours after traumatic wound	5	1.3%		

perceptions and attitudes of health care providers' regarding AM are understood, every learning intercession on AMR and AMS programs will be a failure (Baraka *et al.*, 2019). Thus the present study was conducted to explore the KAP regarding antibiotic stewardship program in physicians at Riyadh.

Most of the participants in the present study were male and had an experience of up to 10 years. This was in accord with the findings of the Indian study (Vandana Badar *et al.*, 2018) as well as another Saudi study (Baraka *et al.*, 2019).

Our findings reveal that 44% of participants were unaware of the term 'Antimicrobial stewardship'. These findings were better than survey on Indian physicians were 56% of participants did not know the term (Vandana Badar *et al.*, 2018). The nationwide implementation of AMS program in Saudi Arabia might be the reason for this difference. However, these Figure 1 are still not very pleasing and point out the dearth of implementation approaches and edification about stewardship program across the country.

Our participants opted most preferred way of updating knowledge were internet and journal followed by CME's and workshop. At the same time, the most preferred way in India was chosen as CME's and workshop (10) and in China as standard textbook (Yang *et al.*, 2016). The preferences might vary based on demographics as well as the socio-economic profile of the country, and it just an essential factor to be remembered while various policy formulation.

Attitude analysis showed that 74.8% physician used pharmacokinetic variability for the basis of choosing a proper dosing schedule. This was in contrast to the previous research were only 58% physician used pharmacokinetic variability for dosing schedule (Vandana Badar *et al.*, 2018). 53.9% participant always and 13% sometimes followed the suggestions given by Hospital Infection Control Committee (HICC) or antimicrobial stewardship team. Their results show disappointing Figure 2 and necessitate urgent internal policy check with-in the hospitals.

The poor practice of not explaining the patient about use and ADRs of AMAs was seen in 56.9% of physicians. Elucidating patient regarding undesirable effects and inappropriate use of antimicrobials is an essential measure to avoid corollary of antimicrobial misuse. Maximum participants responded that they advise simple, rapid lab test before starting AMA therapy. These findings were coinciding with the results of the study conducted in the eastern province of Saudi Arabia (Baraka *et al.*, 2019).

More education should be given to doctors during the UG teaching allied to AMA resistance and suitable prescribing. The 4 'R's Right diagnosis, Right dose, Right drug, Right duration determines the clinical effectiveness of antibiotics (CDC Core, 2014).

Few limitations do exist in this research which must be considered while viewing the results. Firstly it was a cross-sectional study and thus presented with integral limitations of such study designs. These studies single-handedly cannot be used for policy formulation. The data collection tool was a questionnaire which again may or may not depict the actual KAP of the participants. It was conducted only in physicians of the Riyadh city thus limiting generalizability.

CONCLUSIONS

To curb the menace of quickly developing AMA resistance, understanding of its gravity and connotation is important. There should be monitored regular audits of the prescription and gathering of data from prescribers and mass users of antibiotics. Health professionals should be adequately trained regarding the usage of antimicrobials and their consequences. The judicious use of AMA should be promoted by incorporating in the curriculum about proper prescribing, supplying and usage of AMA.

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Conflict of Interest

The authors declare that they have no conflict of interest for this study.

REFERENCES

- Al-Harthi, S. E., Khan, L. M., Osman, A. M. 2015. Perceptions and knowledge regarding antimicrobial stewardship among clinicians in Jeddah, Saudi Arabia. *Saudi Med J*, 36(7):813-820.
- Alomi, Y. 2015. National antimicrobial stewardship program in Saudi Arabia: experiences and future vision. *ClinPharmacolBiopharm*, 4(4):49.
- Alomi, Y. A. 2017. National Antimicrobial Stewardship Program in Saudi Arabia; Initiative and the Future. *Open Access Journal of Surgery*, 4(5):1-7.
- Baraka, M. A., Alsultan, H., Alsalman, T., Alaithan, H., Islam, M. A., Alasseri, A. A. 2019. Health care providers' perceptions regarding antimicrobial stewardship programs (AMS) implementation—facilitators and challenges: a cross-sectional study in the Eastern province of Saudi Arabia. *Annals of Clinical Microbiology and Antimicrobials*, 18(1):26.

- Buckel, W. R., Hersh, A. L., Pavia, A. T., Jones, P. S., Owen-Smith, A. A., Stenehjem, E. 2016. Antimicrobial Stewardship Knowledge, Attitudes, and Practices among Health Care Professionals at Small Community Hospitals. *Hospital Pharmacy*, 51(2):149–157.
- CDC Core 2014. Elements of Hospital Antibiotic Stewardship Programs. Atlanta.
- Charani, E., Castro-Sánchez, E., Holmes, A. 2014. The Role of Behavior Change in Antimicrobial Stewardship. *Infectious Disease Clinics of North America*, 28(2):169–175.
- Dyar, O. J., Pulcini, C., Howard, P., Nathwani, D., Nathwani, D., Beovic, B., Pulcini, C., Harbarth, S., Hanberger, H., Pagani, L., Pardo, J. R. P., Howard, P., Weschesler-Fordos, A. 2014. European medical students: a first multicentre study of knowledge, attitudes and perceptions of antibiotic prescribing and antibiotic resistance. *Journal of Antimicrobial Chemotherapy*, 69(3):842–846.
- Gillespie, E., Rodrigues, A., Wright, L., Williams, N., Stuart, R. L. 2013. Improving antibiotic stewardship by involving nurses. *American Journal of Infection Control*, 41(4):365–367.
- Ohl, C. A., Luther, V. P. 2014. Health Care Provider Education as a Tool to Enhance Antibiotic Stewardship Practices. *Infectious Disease Clinics of North America*, 28(2):177–193.
- Scaioni, G., Gualano, M. R., Gili, R., Masucci, S., Bert, F., Siliquini, R. 2015. Antibiotic Use: A Cross-Sectional Survey Assessing the Knowledge, Attitudes and Practices amongst Students of a School of Medicine in Italy. *PLOS ONE*, 10(4):e0122476.
- Taneja, N., Kaur, R. 2017. Antibiotic Stewardship - Where do we Stand in India? *Ann Pharmacol Pharm*, 2(9):1049.
- Vandana Badar, Parulekar, V. V., Garate, P. 2018. Study of knowledge, attitude and practice amongst medical professionals about antimicrobial stewardship in tertiary care teaching hospital in India: a questionnaire based study. *International Journal of Basic and Clinical Pharmacology*, 7(3):511.
- Wasserman, S., Potgieter, S., Shoul, E., Constant, D., Stewart, A., Mendelson, M., Boyles, T. H. 2017. South African medical students' perceptions and knowledge about antibiotic resistance and appropriate prescribing: Are we providing adequate training to future prescribers? *South African Medical Journal*, 107(5):405.
- Yang, K., Wu, D., Tan, F. 2016. Attitudes and perceptions regarding antimicrobial use and resistance among medical students in Central China. *SpringerPlus*, 5(1):1779.