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Original Research Article

Knowledge, attitude, and perception of prescribers about antimicrobial stewardship in a tertiary care hospital

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ABSTRACT

Background: Irrational antimicrobial use has contributed to amplification and spread of antimicrobial resistance (AMR). Antimicrobial stewardship by healthcare personnel can reduce AMR. The World Health Organization (WHO) has established a worldwide action plan to address AMR, including free online availability of open WHO courses. So, our study sought to ascertain knowledge, attitude, and practice (KAP) of healthcare personnel concerning AMS at tertiary care hospital.
Methods: Study was conducted as a KAP survey among practitioners (faculty, senior and junior residents) from several departments of Government Medical College, Aurangabad, Maharashtra. A validated questionnaire with 30 questions was prepared and distributed to 100 participants. The data collected in MS excel was analyzed with descriptive statistics and results expressed as mean and standard deviation, frequencies, and percentages.
Results: Response rate was 16.7% (n=100). Knowledge on AMS was observed among doctors' with >80% near correct responses in each question. Insignificant knowledge gap was found comparing between faculty members, senior residents, and junior residents ($p>0.005$) in the knowledge, attitude and practice of antimicrobial use. All participants felt that ASP is a requirement of hospital, and it minimizes healthcare expenditures and negative impacts of inappropriate AM prescribing.
Conclusions: All HCPs have a knowledge gap on ASP, although there is no significant difference in knowledge, attitude, and practice of antimicrobial use between faculty members and senior and junior residents. This demonstrates importance of faculty members taking lead in incorporating more practice and education into ASP.

Keywords: KAP study, Antimicrobial resistance, Rational antibiotic use, Antimicrobial Stewardship program

INTRODUCTION

Antibiotics' discovery in the early twentieth century, and their stunning effectiveness in treating illnesses and fatalities, produced complacency in the 1960s and 1970s. These 'wonder medications' have played a major role in decreasing the global burden of communicable diseases over the last six decades.[1] Antimicrobial resistance (AMR) threatens the effective prevention and treatment of an ever-increasing range of infections caused by bacteria, parasites, viruses and fungi.[2] In developing countries like India, the range and burden of infectious diseases are enormous.[3] AM consumption in India has risen to 65%, according to a report published in the Proceedings of the National Academy of Sciences.[4] This growing use results in the evolution of antimicrobial resistance (AMR), which creates "superbugs" that make treating fundamental diseases difficult. AMR is one of the most serious dangers to global health, food security, and development today.[5] When microbes are exposed to AM medicines, they develop antimicrobial resistance over time, mainly through genetic changes.[6] Excessive usage of AM and an insufficient dose of AM have both contributed to the spread of resistant species. New resistance mechanisms are

evolving and spreading over the world, posing a danger to our ability to treat common infectious diseases. Because of prolonged disease duration, ICU stays, more tests, and the use of more expensive drugs, the cost of healthcare for patients with resistant infections is rising faster than for those with non-resistant illnesses.[7-9] The third GLASS report, published in 2018, presents the prevalence of AMR in 2,164,568 patients with laboratory-confirmed infections in 66 countries, territories, and areas. Resistance to ciprofloxacin, which is commonly used to treat urinary tract infections, ranged from 8.4% to 92.9% for E. coli and from 4.1% to 79.4% for K. pneumonia.[10] The CDC's first AR threat report, released in 2013, raised the alarm about an alarming increase in AMR.[11] Furthermore, a lack of new antibiotics jeopardizes global efforts to combat drug-resistant infections.[12-13] Antimicrobial stewardship (AMS) is a coordinated set of practices that encourage the safe use of antimicrobials (AM).[14] An antimicrobial stewardship program (ASP) is a health-care strategy that promotes the appropriate use of antibiotics (AM) through the adoption of evidence-based interventions.[15] A wide range of interventions have been implemented to improve ASP, including the TARGET toolbox in the United Kingdom and an open WHO course. Till now many knowledge, attitude, practice (KAP) studies on AMR have been conducted among community members, medical undergraduate students, which has shown AMR is an increasing national problem, and the attitude of self-medication in about 46% of participants, and the need for more educational tools in non-medical professionals.[16-21] All studies have shown AMR being a great problem (>90%) to public health as well as a national problem, but <60% rate to be a problem in their real clinical practice. Very few, less than 30% knew the prevalence of multi-drug resistant in their hospitals.[22-23] In all of these research studies, the authors discovered gaps in doctors' attitudes on AMR, which are vital for promoting the rational use of AM and developing their hospital ASP; nevertheless, no one uses any specific guideline or online course content if they are practicing with regard to AMS/ASP. The purpose of this study is to determine doctors' knowledge, attitude, and practice about AMS. We expect that this study enhances doctors' knowledge of antimicrobials, with the ultimate goal of reducing AMR.

METHODS

Study setting and design

We conducted a tertiary health care -based observational cross-sectional study among doctors of different departments of Government Medical College, Aurangabad from September to December 2021 over 3 months.

Study population

Doctors with expertise in their fields from Marathwada's tertiary care center, from multiple departments (medicine, surgery, pediatrics, obstetrics, and gynecology) were included with prior consent. Because these departments had the most direct exposure and use of AM with patients, a total of 100 healthcare professionals were recruited for the study. The sample size was calculated by calculating the prevalence of KAP in a previous study. Doctors included faculties, senior residents, and junior residents from 2nd and 3rd-year post-graduate courses, who were primarily responsible for patient treatment decisions.

Assessment material

The questionnaire was self-structured after searching medical literature for comparable studies and adapting questions based on the online open WHO course-antimicrobial stewardship: a competency-based approach (freely available) (WHO, 2018). A total of 30 questions (having subsections) was devised. Face validation was done for the questionnaire by subject expert for its contents and relevance. This questionnaire had not been used in any other study; however, similar questions had been assessed for previous KAP studies. The questions were evaluated on a 3-point Likert scale with response options of agree (A)/disagree(D)/uncertain(U).

Operational definition

The following definitions were used to select the participants enrolled in the study. Target population consisted of all the practicing doctors in this single tertiary health care. Junior residents included postgraduate students in 1st, 2^{nd,} and 3rd year. Senior residents included those who have completed their post-graduation. Faculty were the consultants (Assistant, Associate Professors and Professors), and responders included the participants who gave consent to participate in the study and returned the filled questionnaire were defined as the responders.

Methodology

Before beginning the survey, the institutional ethical committee Government Medical College, Aurangabad, reviewed and authorized the project (No. 524/IEC/GMCA/2018). Members of the target population who were present throughout the survey period and provided consent by filling out the Google form shared with them via email were included in the study. Those not willing for consent were excluded from study. The questionnaire was delivered to all clinical departments' active doctors who administer antimicrobials. Due to the rarity of antibiotic use, doctors from the departments of radiology, anesthesia, psychiatry, and were excluded. Interns working in the hospital were also excluded. Those who did not submit on the first visit were re-visited or re-mailed up to three times before being deemed as a non-responder. There were no incentives for participation.

Data analysis

They were reviewed for completeness after collecting the questionnaire and acquiring the necessary data in a Google sheet. All data gathered was classified as junior and senior

resident's versus faculty members (Assistant Professors, Associate professors and Professor). Participants were also divided into subgroups based on their ranking. The statistical package for social sciences (SPSS) was used to analyze and interpret the data. The proportions were computed. For categorical data, the Pearson Chi-square test was utilized. The final findings were compared to the correct answers to the questions, and the results were presented using tables and diagrams. The Chi-square test was used to assess group differences. P values less than 0.05 were considered statistically significant. We followed the strengthening the reporting of observational studies in epidemiology (STROBE) guidelines to report our findings.

RESULTS

Baseline characteristics

The questionnaire was shared to more than 600 participants through their ease of convenience online, 100 participants (response rate 16.5%) from 12 departments completed the study and were analyzed under categories of gender, departments, positions. Gender wise 56% male and 44% females participated in study. Age groupwise distribution demonstrated maximum participation from 22-30 years of age (79%) followed by 31-40 years (16%). The data showed maximum participation from the Department of Medicine (37%) followed by department of pediatrics (27%). Designation wise most participants were the junior residents (72%) followed by Assistant Professors (12%) (Figure 1).

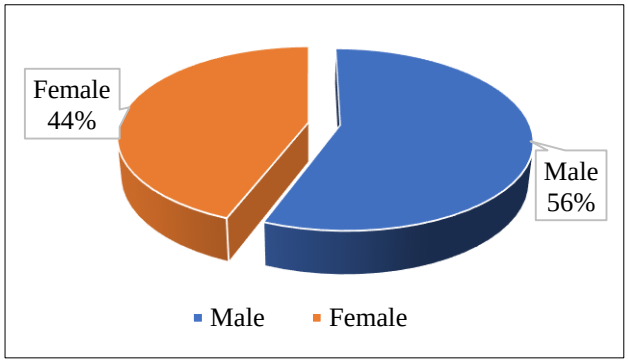

Figure 1: Gender distribution of study participants.

Only those participants who completely answered validated questionnaire of 30 questions (each 10 for KAP) were analyzed in final results (n=100). A multiple-choice questionnaire with was created to assess the KAP of relevant subjects. Questions were chosen from previously published papers, edited, and updated as needed.[24-27] Answers were recorded using a 3-point Likert scale. The content validity index (CVI) was utilized by content specialists to assess each question's simplicity, clarity, and understandability. The responses were graded on a three-point Likert scale with a symmetric range of "agree," "disagree," and "uncertain" (Tables 1-3). It is worth noting that the questionnaire did not need participants' identifications, names, or initials, and their responses were kept strictly confidential.

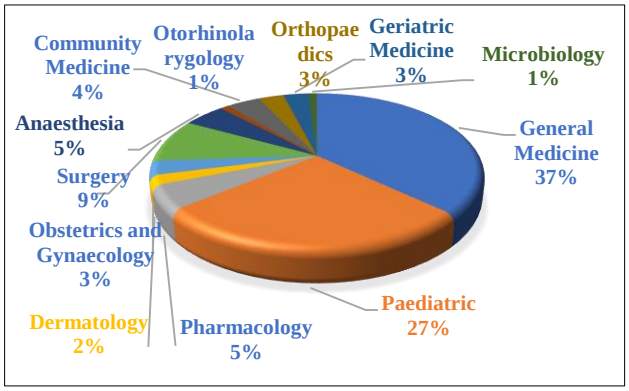

Figure 2: Distribution of study participants as per department.

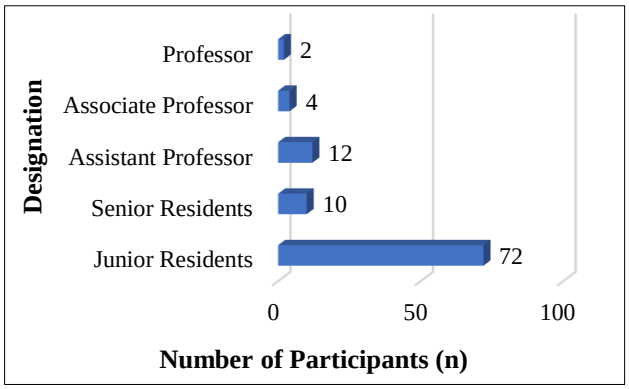

Figure 3: Distribution of study participants as per designation.

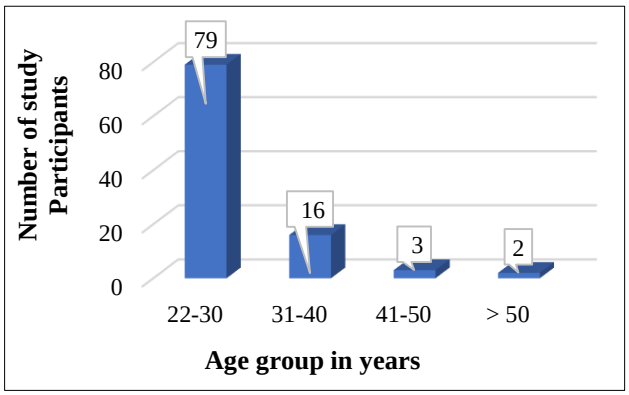

Figure 4: Distribution of study participants as per age group.

Knowledge about antimicrobial stewardship

After analyzing the responses from the knowledge section, it was found that 98% participants considered AMS is related to improving antimicrobial use for better clinical outcomes, minimizing adverse events and antimicrobial

resistance. More than 95% participants agreed to facts like indiscriminate and injudicious use of antibiotics may lead to ineffective treatment, indiscriminate and injudicious use of antibiotics may lead to emergence of bacterial resistance and it may lead to additional burden of medical cost to patient. Least correct responses were observed to questions like antibiotics, if taken too often, will not affect their efficacy in the future (65% correct) and is the efficacy better if the antibiotics are newer and costlier (71% correct). Average aggregated correctness in terms of percentage for knowledge aspect was 89.5% with standard deviation (SD) of 11.58% (Table 1).

Attitude aspect of AMS (antimicrobial stewardship)

Response analysis from attitude section revealed, 99% participants agreed misuse of antibiotics contribute to development of antibiotic resistance. More than 95% participants knew that antibiotic resistance affect self and family member's health treatment in future and we need to follow right drug, right dose, right time, right duration for every patient. Least correct responses were observed to questions like 'when I have fever, antibiotics help me to get better more quickly (55%), are antibiotics available as (OTC) over the counter medicines (62%), and skipping one or two doses of antibiotic, does not contribute to development of antibiotic resistance (67%). Mean correctness in terms of percentage for attitude aspect was 80.7% with standard deviation (SD) of 15.7% (Table 2).

Practice part of AMS (antimicrobial stewardship)

Analysis of responses from practice section showed, 100% participants advice patients to complete full course of antibiotic treatment. More than 95% study participants ask their patients to check expiry date of antibiotic before using it. In case of apparent failure of treatment, and considers opinion of infectious disease physician and or a microbiologist. Least correct answers were found to questions like 'do you ask your patient to discard leftover, remaining medication' (47%) and broad-spectrum antibiotic should be prescribed for quick recovery from commonest infections in patients (69%). Mean correctness in terms of practice aspect of AMS was 86.4% with standard deviation (SD) of 16.37% (Table 3).

Comparison of knowledge, attitude and practice of AMS between residents and faculty members

We also did a subgroup analysis for comparing knowledge, attitude and practice of AMS between two unequal sample group of residents and faculty members using Chi square test (χ^2 test) find out statistical significance, and found out though percentage of correct answers in all three aspects of AMS were more in faculty members group but there was no statistically significant difference between two groups (p values 0.17 for knowledge comparison, 0.46 attitude comparison, 0.11 for practice comparison of AMS (Table 4).

Table 1: Validated questionnaire with responses of study participants (knowledge).

S. no.	Knowledge	Responses (%) (n=100)			Analysis (correct responses)			
		Agree	Disagree	Uncertain	Answer	Right	Wrong	Not sure
Q1	Antimicrobial stewardship (AMS) is related to improving antimicrobial use for better clinical outcomes, minimizing adverse events and antimicrobial resistance.	98	1	1	Agree	98	1	1
Q2	Indiscriminate and injudicious use of antibiotics may lead to ineffective treatment.	96	3	1	Agree	96	3	1
Q3	Indiscriminate and Injudicious use of antibiotics may lead to increased adverse effects.	93	4	3	Agree	93	4	3
Q4	Indiscriminate and injudicious use of antibiotics may lead to adverse events.	94	2	4	Agree	94	2	4
Q5	Indiscriminate and injudicious use of antibiotics may lead to emergence of bacterial resistance.	97	1	2	Agree	97	1	2
Q6	Indiscriminate and injudicious use of antibiotics may lead to additional burden of medical cost to patient.	95	2	3	Agree	95	2	3
Q7	Antibiotics, if taken too often, will not affect their efficacy in the future.	32	65	3	Dis-agree	65	32	3

Continued.

S. no.	Knowledge	Responses (%) (n=100)			Analysis (correct responses)			
		Agree	Disagree	Uncertain	Answer	Right	Wrong	Not sure
Q8	Antibiotic resistance is not a serious health issue faced by hospitals.	4	95	1	Dis-agree	95	4	1
Q9	Is the efficacy better if the antibiotics are newer and more costly.	13	71	16	Dis-agree	71	13	16
Q10	Do we need to prescribe antibiotics according to WHO AWaRe (access, watch and reserve group) guidelines.	91	3	6	Agree	91	3	6
Percentage						89.5	6.50	4

Table 2: Validated questionnaire with responses of study participants (attitude).

S. no.	Attitude	Responses (%) (n=100)			Analysis (correct responses)			
		Agree	Disagree	Uncertain	Answer	Right	Wrong	Not sure
Q1	In present scenario, when I have common cold, I should take an antibiotic to prevent more serious illness.	10	86	4	Dis-agree	86	10	4
Q2	When I have fever, antibiotics help me to get better more quickly.	24	55	21	Dis-agree	55	24	21
Q3	Misuse of antibiotics may contribute to development of antibiotic resistance.	99	0	1	Agree	99	0	1
Q4	Skipping one or two doses of antibiotic, does not contribute to development of antibiotic resistance.	21	68	11	Dis-agree	68	21	11
Q5	Antibiotics are safe drugs hence they can be commonly used.	10	83	7	Dis-agree	83	10	7
Q6	Antibiotic resistance may affect you and your family's health treatment in future.	96	3	1	Agree	96	3	1
Q7	Do we need to follow right drug, right dose, right time, right duration for every patient	97	2	1	Agree	97	2	1
Q8	"AMS" course should be initiated at university level.	90	3	7	Agree	90	3	7
Q9	Are antibiotics available as over the counter medicines (OTC)	62	34	4	Agree	62	34	4
Q10	Sufficient time for proper consultation and prescriptions in hospitals is missing.	71	21	8	Agree	71	21	8
Percentage						80.70	12.80	6.50

Table 3: Validated questionnaire with responses of study participants (practice).

S. no.	Practice	Responses (%) (n=100)			Analysis (correct responses)			
		Agree	Disagree	Uncertain	Answer	Right	Wrong	Not sure
Q1	Do we need to put a stop date for antibiotics use in our prescriptions?	87	7	6	Agree	87	7	6
Q2	After prescription of antibiotic course if a patient feels better after 2 or 3 doses, do we recommend to stop antibiotics?	7	90	3	Dis-agree	90	7	3

Continued.

S. no.	Practice	Responses (%) (n=100)			Analysis (correct responses)			
		Agree	Disagree	Uncertain	Answer	Right	Wrong	Not sure
Q3	Is it recommended to save remaining doses of antibiotics by the patient for next time usage by patient as self-prescription for any infections?	7	89	4	Dis-agree	89	7	4
Q4	Do you ask your patient to discard leftover, remaining medication?	47	44	9	Agree	47	44	9
Q5	Do you ask patient to complete full course of antibiotic treatment?	100	0	0	Agree	100	0	0
Q6	Do you check expiry date of antibiotic before using it for yourself?	98	2	0	Agree	98	2	0
Q7	Do you ask your patient to check expiry date of antibiotic before using it.	95	3	2	Agree	95	3	2
Q8	In case of apparent failure of treatment, does an opinion of infectious disease physician & or a microbiologist is required?	97	2	1	Agree	97	2	1
Q9	Broad spectrum antibiotic should be prescribed for quick recovery from commonest infections in patients.	24	69	7	Dis-agree	69	24	7
Q10	De-escalation of treatment advised should be done on basis of clinical situations and microbiological results	92	6	2	Agree	92	6	2
Percentage						86.40	10.20	3.40

Table 4: Comparison of KAP of AMS between residents and faculty members.

KAP	Total no of responses (n=1000)		P value (χ^2 test)
	Aggregate correct	Not correct	
Knowledge			
Senior and junior residents (82)	739	81	0.17
Faculty members (18)	156	24	
Attitude			
Senior and junior residents (82)	665	155	0.46
Faculty members (18)	142	38	
Practice			
Senior and junior residents (82)	702	118	0.11
Faculty members (18)	162	18	

DISCUSSION

Total of 100 respondents participated and completed the questionnaire study. The mean age of participants was 29±5.3 years. The response rate of 16.5% can be attributed to the lack of time as well as interest among the study population. All study populations, however, were revisited three times to ensure compliance. Contrast to this, a response rate of 65% of the total population was seen by a previous study done by Kaur et al and Chatterjee et al.

As a national and global issue, AMR imposes a financial and health burden on governments. Knowledge of the antimicrobial activity spectrum and its relationship to resistance can help health care personnel use antimicrobials correctly, lowering AMR.[28] Low-income countries with limited access to antibiotics and poor infection control policies may bear a disproportionate share of this burden.[29] Our study states Insignificant knowledge gap when a comparison was made between faculty members, senior residents and junior residents to compare KAP of AMS ($p>0.005$). This was in contrast with similar study conducted by Kaur et al to compare KAP of residents and faculty members ($p<0.001$) and study by Firouzabadi et al (<0.005).[30,31] The open WHO AMS course may help to close this gap. Respondents

generally recognized antibiotic misuse and antimicrobial stewardship as important issues, and most had positive attitudes toward ASPs, both in terms of their ability to increase the appropriateness of antimicrobial prescribing and to improve patient care, as described in similar studies.[32,33] The survey also revealed several specific and actionable deficiencies in knowledge, prescribing practices, and awareness of available resources, all of which can be addressed to improve antimicrobial prescribing at the study hospitals. Many of these flaws have also been discovered in other studies.[34-36.]

The inclusion of a wide range of prescriber types, experiences, and hospital settings is one of the strengths of our study, as it increases the generalizability of the findings.

Limitations

Because participation was voluntary and response rates were low, volunteer bias is possible. Some specialties had lower response rates than others. Many of the questions concern self-perceived confidence, which can be difficult to assess and interpret. WHO has launched the open WHO online platform: "antimicrobial stewardship: a competency-based approach," a basic free course on AMS that can be a better way to assess doctors from a wide range of specialties who have varying experience profiles with AM in their clinical practice.

CONCLUSION

Education of antimicrobials prescriber is a key role of the ASP team and that there is “tailored” approach to education. Understanding the facilitators and barriers to appropriate antimicrobial prescribing within a healthcare facility and among prescribers is critical to the successful implementation of ASPs. Antimicrobial stewardship is to be led by faculty among practicing residents and freely available open WHO course is necessary to make more steward to tackle the growing antimicrobial resistance.

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