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### **Original Research Article**

# Study of knowledge, attitude and practice amongst medical professionals about antimicrobial stewardship in tertiary care teaching hospital in India: a questionnaire based study

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#### **ABSTRACT**

**Background:** Appropriate selection of antimicrobial drugs is critical to optimize treatment of infections ad limit the spread of antimicrobial resistance. Antimicrobial resistance is a serious global problem of antimicrobial abuse and there is a growing consensus to urgently develop new strategies for prevention of resistance of bacteria to antimicrobial agents. Relatively few studies of knowledge, attitude and practice are published regarding antimicrobial resistance. Methods: To explore the perceptions of knowledge, attitude and practice of antimicrobial agent use and its resistance in medical professionals in a tertiary teaching care hospital in India. This study was a cross-sectional, questionnaire based study conducted in tertiary care teaching hospital in India for a duration of three months and on a sample size of 300. All medical teachers, residents and interns were included in studies. Questionnaire included 8 questions of knowledge, 10 questions of attitude and 8 questions of practice. The parameters on which the data was analysed were, gender-wise distribution of data, Age-wise distribution of data, hierarchy-wise distribution- Residents, Lecturers, Assistant Professors, Associate Professors, Professors, according to years of experience, Departmental survey. Some questions were assessed by Likert scale, whose responses ranged from always to never. Some questions were of yes and no type, others were multiple choice questions.

**Results:** The majority of respondents were males (65.66%). Most of the participants were from 21-30years (44%) followed by 31-40 years (32.66%). Almost 77.6% participants had upto 5 years of experience in their respective field. Participants had good knowledge, positive attitude and followed a rational and fair practice about antimicrobial stewardship.

**Conclusions:** Adequate training should be given to UGs and PGs about antimicrobial chemotherapy and its usage. It should be part of their curriculum-proper prescribing, dispensing and usage of AMA so as to promote judicious use of AMA.

**Keywords:** Antimicrobial stewardship, Attitude, Knowledge, Medical professionals, Practice

#### INTRODUCTION

Antimicrobial stewardship is nothing but an integrated approach to improve and measure the appropriate use of antimicrobials by promoting the selection of antimicrobial drug regimen with suitable route of administration, dose

and duration of therapy.<sup>1,2</sup> This minimizes the risk of toxicity and adverse reaction, promotes cost-effectiveness of therapy and restrict the choice for antimicrobial resistant strains. Appropriate selection of antimicrobial drugs is critical to optimize treatment of infections and limit the spread of antimicrobial resistance.<sup>3</sup> The treat of AMA

resistance is rapidly developing and escalating. The awareness on its seriousness and significance is the first step of approach for hampering its spread. To undertake instructional and educational campaigns among the general population as well as among the health care personnel regarding antibiotic resistance, its dangerous consequences and prevention of its development and spread, to train undergraduate and postgraduate medical, pharmacy and nursing regarding proper prescribing, dispensing and use of antimicrobials, to carry out surveillance studies of knowledge, attitude and practice among the medical and paramedical professionals are various remedial steps suggested to overcome the problem of AMA resistance.<sup>4</sup> Antimicrobial resistance is a serious global problem of antimicrobial abuse and there is a growing consensus to urgently develop new strategies for prevention of resistance of bacteria to antimicrobial agents.5 Improper use of antimicrobials leading to resistance is a because of numerous factors such as prescribers knowledge and experience, diagnostic uncertainty, prescribing on patient's demand, seniors as a role model, drug promotional practices, overload of patients and negligence of proper prescribing, selfmedication of patients.<sup>6</sup> Relatively few studies of knowledge, attitude and practice are published regarding antimicrobial resistance. So, it is worthwhile to assess the attitude awareness knowledge, and regarding antimicrobial stewardship in the tertiary care teaching hospital.

Aims and objectives of the study was to explore the perceptions of knowledge, attitude and practice of antimicrobial agent use and its resistance in medical professionals in a tertiary teaching care hospital in India.

#### **METHODS**

This study was a cross-sectional, questionnaire based survey undertaken in a tertiary teaching care hospital in India among the medical and paramedical professionals including interns, residents, lecturers, associate professors and professors. However paramedical professionals and MBBS students were excluded from study. The questionnaire was self-structured and pre-validated by the subject experts for its content and relevance. The questionnaire comprised of 8 questions of knowledge and practice each and 10 questions on attitude. Some questions were ves or no type, others were evaluated on 5-point Likert scale ranging from always to never, rest were multiple choice questions. The questionnaire was distributed to 300 medical health professionals and were asked to complete the questionnaire. The duration of study was of 3 months and study was initiated after the approval from the Institutional Ethics committee (IEC/50/2017).

#### Statistical analysis

Simple descriptive statistics was used to generate percentages and proportions.

#### **RESULTS**

The total number of questionnaires distributed and completed were 300 (Table 1). The departments included in the study in the chronological order were medicine, surgery, community medicine, pathology, microbiology, ophthalmology, ENT, pulmonary medicine, orthopaedics, anesthesia, dermatology, dental surgery, pharmacology and casualty medical officers. Knowledge, attitude and practice of participants was evaluated (Table 2 to Table 4, Figure 1).

Table 1: Demographic characteristics of participants.

Total number of participants (n=300)				
Gender-wise distribution	Numbers	Percentage (%)		
Males	197	65.66		
Females	103	34.33		
Age-wise distribution (in years)				
21-30	146	48.66		
31-40	87	29		
41-50	22	7.33		
51-60	30	10		
>60	15	5		
Years of experience				
0-5	233	77.6		
6-10	27	9		
11-15	9	3		
16-20	8	2.66		
21-25	5	1.66		
26-30	13	4.33		
31-35	2	0.66		
36-40	3	1		

Table 1 showed male preponderance with 65.66% in this study. Most common age group was 21-30years (48.66%) and majority of participants (77.6%) fall in 0-5 years of experience group.

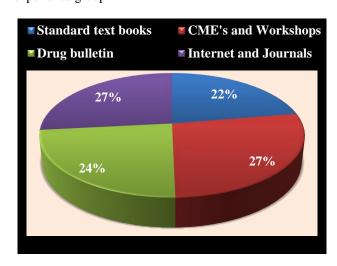


Figure 1: Most preferred way of updating the knowledge.

Figure 1 showed 54% of participants preferred way of updating the knowledge by Internet, Journals, CME's and workshops.

In Table 2, 99% of participants knew the difference between bacteriostatic and bacteriocidal AMAs and narrow and broad spectrum AMAs however the term antimicrobial stewardship was known to 44% of participants. Other knowledge related multiple choice questions were fairly answered by the participants.

Table 3 showed optimistic attitude of the participants towards use of AMAs. 86% of participants relied on clinical judgement and clinical and experimental evidence for selection of AMAs. 62% of participants always followed suggestions given by HICC.

Table 4 showed sufficiently good practice of the participants in this study. 95% of participants do not prescribe AMAs on demand of patients and always explained uses and ADRs of AMAs. 85.66% participants

have created awareness amongst their colleagues, patients and students.

#### **DISCUSSION**

In this study, we found that, most of the health care professionals are males and of age group 21-30 years with majority of experience upto 5 years. These findings coincide with the findings of Tegagn GT et al study.<sup>7</sup>

As far as knowledge of AMA resistance is concerned all health professionals and residents had fair knowledge regarding AMA resistance. However, 56% of participants did not know the term 'Antimicrobial stewardship' which indicates paucity of implementation strategies and education regarding various stewardship programs across the country. Most preferred way of updating knowledge for participants were CME's and workshop followed by internet and journal and standard text book unlike Yang K et al, for which most common way was text books and other guides (80.2%).8

Table 2: Knowledge of the participants.

Questionnaire (n=300)	
1. Do you know the difference between bacteriostatic and bactericidal Antimicrobial agents (AN	MAs)?
a. Yes	298 (99.33%)
b. No	2 (0.66%)
2. Do you know the difference between broad spectrum and narrow spectrum antimicrobials?	
a. Yes	297 (99%)
b. No	3 (1%)
3. Do you know the term antimicrobial stewardship?	
a. Yes	132 (44%)
b. No	168 (56%)
4. Which of the following mechanisms are for drug resistance?	
a. Increased entry of antibiotic into pathogen	12 (4%)
b. Decreased export by efflux pumps	40 (13.33 %)
c. Alteration of target proteins	161 (53.66%)
d. Release of microbial enzymes that destroy the antibiotic	87 (29%)
5. Which of the following are responsible for emergence of consequences for drug resistance?	
a. Drug-resistant pathogen	145 (48.33%)
b. Toxicity to the patient	40 (13.33%)
c. Requirement of higher AMA	78 (26%)
d. Fetal damage	37 (12.33%)
6. Drugs used to treat gram negative anaerobes?	
a. Metronidazole	190 (63.33%)
b. Fluoroquinolones	17 (5.66%)
c. Imipenem	77 (25.66%)
d. Cotrimoxazole	16 (5.33%)
7. Regarding storage of AMAs, which of following is/are correct-	
a. Storage should be according to brand name	52 (17.33%)
b. Most antibiotics need temperature of 15-20°C	201 (67%)
c. Cool storage means refrigeration	40 (13.33%)
d. Short expiry medicines should be kept at back	7 (2.33%)

**Table 3: Attitude of the participants.** 

Attitude of the participants (n=300)			
1. What precautions do you take to prevent AMA resistance?			
a. Use of AMAs when necessary after AST	221 (73.66%)		
b. Using > 1 AMAs at a time	59 (19.66%)		
c. Using newer AMAs for long duration			
d. Use of broad spectrum AMAs for mild short-term illness	20 (0.66%)		
2. Which criteria do you use for selection of AMAs?			
a. Clinical judgement	137 (45.66%)		
b. Empirical therapy	33 (11%)		
c. Clinical and experimental evidence	130 (40.33%)		
d. Lucrative practices			
3. What is/are the basis of choosing a proper dosing schedule?			
a. As per Pharmacokinetic variability	174 (58 %)		
b. Integrating microbial PK-PD studies	65 (21.66%)		
c. As per minimum inhibitory concentration of pathogen	58 (19.33%)		
d. According to post-antibiotic effect	3 (1%)		
4. How frequently you follow the suggestions given by Hospital Infection Control Committee (HI			
a. Always	186 (62%)		
b. Often	52 (17.33%)		
c. Sometimes	51 (17%)		
d. Seldom or never	11 (3.66%)		
5. When do you use empirical therapy?	11 (3.0070)		
a. Life-threatening infection	108 (36%)		
b. Recurrent local wound infection	24 (8%)		
c. Community acquired infections	82 (27.33%)		
d. Failure to respond to initial therapy	86 (28.66%)		
6. Why do you insist combination therapy?	80 (28.0070)		
a. To accelerate rapidity of microbial activity	45 (15%)		
b. To enhance therapeutic efficacy	97 (32.33%)		
c. To prevent resistance to monotherapy	139 (46.33%)		
**			
d. To reduce severity or incidence of ADR 19 (6.33%)			
7. Does risk of ADR increase with post-treatment suppressive therapy (secondary prophylaxis)?  a. Yes	126 (42%)		
b. No	174 (58%)		
8. When do you are secondary prophylaxis?	62 (210/)		
a. For all AIDS nationts	63 (21%)		
b. For all AIDS patients	72 (24%)		
c. For all post-transplant patients	72 (24%)		
d. For all patients with major disease	93 (31%)		
9. How do you prevent super-infections?	257 (95 (60))		
a. Use of specific AMAs	257 (85.66%)		
b. Use of AMAs to treat self-limiting illness	26 (0.660/)		
c. Use of narrow spectrum AMAs	26 (8.66%)		
d. Use of AMAs for prolong period	17 (5.66%)		
10. Most common reason for misuse of AMAs	00 (20 220)		
a. Conflicting advertising claims of superiority to newer AMAs	88 (29.33%)		
b. Prescribing AMAs without prior antibiotic sensitivity test (AST) (Impatient for AST report)	79 (26.33%)		
c. Strong clinical suspicion of an infection	47 (15.66%)		
d. According to availability of AMAs and following opinion of senior doctors	86 (28.66%)		

As per the proverb, 'as you sow, so shall you reap', it has been emphasized that adequate training should be provided for UG medical, pharmacy and nursing students-for proper prescribing, dispensing the usage of AMAs.

Young doctors should be given more education during the UG training related to AMA resistance and appropriate prescribing. This is a crucial time period during which the importance of these issues should be emphasized.<sup>4</sup>

Table 4: Practice followed by the participants.

1. Do you prescribe AMAs on demand of patients?		
a. Yes	9 (3%)	
b. No	291 (97%)	
2. Do you explain the patient about use and ADRs of AMAs?		
a. Yes	279 (93%)	
b. No	21 (7%)	
3. Do you advice simple rapid lab tests before starting AMA therapy?		
a. Always	74 (24.66%)	
b. Often	89 (29.66%)	
c. Sometimes	93 (31%)	
d. Seldom or Never	44 (14.66%)	
4. Do you advice culture-sensitivity in all severe cases if not responding to AMA?		
a. Always	209 (69.66%)	
b. Often	31 (10.33%)	
c. Sometimes	93 (31%)	
d. Seldom or Never	44 (14.66%)	
5. When do you switch from I/V to oral AMAs?		
a. Tachycardia >12 hours or febrile > 24 hours	25 (8.33%)	
b. Clinical improvement	213 (71%)	
c. No ongoing problems with absorption	62 (20.66%)	
d. Suitable oral AMA available		
6. Average duration of AMA treatment that you prescribe for community-acquired pn	eumonia-	
a. 3-5 days	88 (29.33%)	
b. 7-14 days	197 (65.66%)	
c. 24-28 days		
d. >28 days	15 (5%)	
7. Ideal duration of surgical prophylaxis (pre, during, post-surgical) that you suggest-		
a. 1 hour before incision	142 (47.33%)	
b. > 24 hours after surgery for clean wounds	76 (25.33%)	
c. At the time of ocular surgeries (intra-operational)	14 (4.66%)	
d. 12 hours after traumatic wound	68 (22.66%)	
8. Have you created awareness regarding AMA resistance among fellow colleagues, patients and students?		
a. Yes	257 (85.66%)	
b. No	43 (14.33%)	

Attitude regarding AMA resistance, prevention and selection of necessary AMA was observed satisfactorily positive. The clinical effectiveness of antibiotics depends on their correct use i.e. 4R Right diagnosis, Right dose, Right drug, Right duration.<sup>9</sup>

However, physicians decisions may be influenced by severe factors such as lack of updated information, pressure from patients, families. 10 The patient related factors also encourage resistance like improper use- small doses, incomplete schedule, days, self medications- single AMA dosing, demand for higher antibiotics, injectable preprations, costly medicines; insistence of rapid recovery. Physician factors such as using AMAs for viral illness and non-specific diarrhoeas; use of drugs not related to disease use of chloroquine/ ciprofloxacin for any fever. selection of wrong drug - use of erythromycin for urinary tract infection; incorrect dose- underdoes /overdose; incorrect

duration of treatment, prolonged post surgical use of AMAs or stoppage of AMAs as soon as relief is obtained; unnecessary use of drug combinations, amoxycilln + cloxacillin for staphylococcal infections; imprecise diagnosis- medication is given to cover all possible causes of illness-blanket covering.<sup>6</sup>

As most of health professionals in the hospital follow the suggestions given by Hospital Infection Control Committee (HICC) and use empirical therapy for life threatening infections. These presenting health professionals use more than one AMA for mixed severe infections and practice secondary prophylaxis fairly well. However, absence of computer assisted programmes especially in government hospitals create obstacle in the smooth working of stewardship programme.

Prescription on patient's demand was not practiced by participants in this study thus preventing from irrational use of antimicrobials. Other factors predisposing to infection and irrational antimicrobial use like detection and treating of malnutrition at early stage, ensuring up-to-date vaccination, early diagnosis of malaria and viral infections to reduce antimicrobial use should be controlled. Explaining patient about the adverse effects and use of antimicrobials so that consequences of antimicrobial misuse can be circumvented.

Majority of 73.66% participants agreed use of AMAs after antibiotic sensitivity testing (AST) or simple rapid laboratory testing. Availability of standardized Microbiology laboratories is limited to bigger hospitals and major cities so measures should be initiated to expand the network of accredited laboratories. <sup>11</sup> Low-cost diagnostic methods and rapid bedside diagnostics should be explored as it can overcome the problem of financial constraints in a resource-limited setting.

The pharmacy driven interventions like Automatic changes from intravenous to oral antibiotic therapy in appropriate situations and for antibiotics with good (e.g., fluoroquinolones, absorption trimethoprimsulfamethoxazole, linezolid, etc.) improved patient safety by reducing the need for intravenous access. 9,12,13 In this study, ideal duration of surgical prophylaxis was found to be one hour prior to incision (47.33%). In order to avoid antimicrobial resistance, recommendations for all common surgical interventions, including timing of initial dose and exceptional circumstances for repeat doses should be followed. In this study, 85.6% participants had created awareness amongst patients, students and fellow colleagues. Awareness campaigns targeting the medical professionals, prescribers, dispensers regarding the rules and laws of antimicrobial prescription and following the standard treatment guidelines should be initiated. Development of economic case for sustainable investment which takes account of needs of all countries and increase in investment in new medicines, diagnostic tools, vaccines and other interventions can help in combating the antimicrobial resistance.14

Patient education interventions, delivered prior to illness, can significantly reduce inappropriate use of AMAs and reverse resistance trends.<sup>15</sup>

#### **CONCLUSION**

The threat of AMA resistance is rapidly progressing and intensifying. The awareness on its seriousness and significance is the first step towards curtailing its progress. Undertaking of instructional and educational campaigns among the general population and health professionals about AMA resistance and its dangerous consequences and steps to limit its spread and developments of resistance. Issues like hand hygiene, restrictions on schedule H1 and X uses should be discussed thoroughly and implemented. Prescription audits and data collection

from manufacturers, prescribers and bulk users of antibiotics should be routinely monitored. Adequate training should be given to UGs and PGs about antimicrobial chemotherapy and its usage. It should be part of their curriculum- proper prescribing, dispensing and usage of AMA so as to promote judicious use of AMA.

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Institutional Ethics Committee (IEC/50/2017)

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