



## Pharmacology

## A STUDY ON KNOWLEDGE, ATTITUDE AND PERCEPTION ABOUT ANTIMICROBIAL PRESCRIBING AMONG UNDERGRADUATES IN A TERTIARY CARE TEACHING HOSPITAL.

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**ABSTRACT** **Objectives:** This study was planned to identify the current knowledge, attitude and perception (KAP) of medical undergraduates about antimicrobial (AM) prescribing with the aim to develop better educational programmes in the training curriculum and promote antimicrobial stewardship.

**Materials and Methods:** A cross sectional questionnaire-based survey was carried out among the 140 final year students at a tertiary care teaching hospital in Kanpur. Each respondent completed the given questionnaire independently in the allocated time. A scoring system was used to rate the KAP of the respondents as poor, average or good.

**Results:** The attitude and knowledge of the UG students towards AM prescribing was “good” however, the deficiencies in their perception regarding their AM prescribing skills need to be improved further.

**Conclusion:** Suitable interventions such as educational and stewardship programmes to address these lacunae must be planned.

**KEYWORDS :** Antimicrobial prescribing, antimicrobial stewardship, clinical case-based learning, medical undergraduates, questionnaire.

### Introduction

Antimicrobials are by far one of the most common groups of drugs used in a health care facility and account for a major part of health care budget. Inappropriate prescription, dispensing and use have led to development of antimicrobial resistance which is rapidly emerging as a global menace for effective medical care. Hence, the implementation of antimicrobial stewardship education in the undergraduate (UG) curriculum is crucial as mere guidelines are not enough to change the behaviour of the future prescribers.[1,2] The WHO recently highlighted the importance of undergraduate training in prudent prescribing.[3] There has been little investigation of students' knowledge, attitude and perception about the antibiotic prescribing. With this background the current study was planned to identify the knowledge, attitude, and perception (KAP) of medical undergraduates about antimicrobial (AM) prescribing with the aim to develop better educational programmes in the training curriculum and promote antimicrobial stewardship.

### Materials and Methods

This cross-sectional questionnaire-based survey was approved by the Institutional Ethics Committee and conducted in the month of July, 2016 for a period of 10 days at a tertiary care teaching hospital in Kanpur. A written informed consent was sought from a total of 140 final year medical students who volunteered to participate in this study. All the students were briefed about the aims and the objectives of the study and the importance of participation in the study. A structured and pretested questionnaire in English, designed after a thorough literature review of comparable studies [4-10] was drafted by making the obtained modifications to the work of Abbo and Rocha. [11] Senior professors experienced in clinical and academic related research validated the questionnaire for its content and relevance. The questionnaire has three sections. The first assesses the knowledge of the respondents about rational AM prescribing, the second section judges the attitude of the prescribers towards AM stewardship and the third section analyses the perception of the students about their acquired skills and knowledge of AM prescribing. Each respondent answered the questionnaire independently in 20 min without using any reference material. The collected data was analysed using SPSS for Windows, version 16.0 (Chicago, SPSS Inc.) with statistical significance evaluated using two sided P value with  $p < 0.05$  as significant.

### Scoring

In the knowledge section, each correct answer was given a score of 1

while each wrong answer was given a score of 0. Each question in this section had only one correct answer and three wrong answers. This way, a respondent could score a maximum of 12 and a minimum of 0 in this section. For attitude, a score of 1 was given to “disagree,” a score of 2 was given to “don't know,” and a score of 3 was given to “agree.” There were four negatively-framed statements for which reverse scoring was done which means a score of 1 was given to “agree,” 2 to “don't know,” and 3 to “disagree.” This way, a respondent could score a maximum of 24 and a minimum of 8 in the attitude section. In the perception section, each “yes” response received a score of 1 while each “no” received a score of 0. Therefore, a respondent could score a maximum of 12 and a minimum of 0 in the practice section. The total KAP scores were calculated and analysed for their statistical significance. The scores were also classified as poor, average, and good.

### Results

#### Knowledge

Out of the total 140 medical UGs who participated in the study, 70% answered the questions in the knowledge section correctly. From the observations of our study as in table 1, it can be inferred that the students strongly believe excessive antimicrobial use as the most important contributor to AM resistance (93%) and the least important contributor as poor hand hygiene (50%). The respondent knowledge scores were classified as poor (0–4), average (5–8) and good (9–12); and the results of our study indicated 10%, 25% and 65% of students in respective categories.

**Table 1: Knowledge of the students about antimicrobial prescribing practices which contribute most to promoting AR**

| Questions  | Correct Response (n = 140) n (%) |
|--|----------------------------------|
| Too many antibiotic prescriptions                    | 130 (93)                         |
| Too many broad-spectrum antibiotics used             | 129 (92)                         |
| Poor hand hygiene                                    | 70 (50)                          |
| Excessive use of antibiotics in livestock            | 42 (30)                          |
| Piperacillin over ampicillin for equivalent time     | 43 (31)                          |
| Ceftriaxone over gentamicin for equivalent time      | 28 (20)                          |
| Clarithromycin over azithromycin for equivalent time | 56 (40)                          |

|   |           |
|---|-----------|
| AM for viral infection  | 140 (100) |
| Prolonged prophylactic therapy and prolonged empiric AM treatment without clear evidence of infection | 140 (100) |
| AM for the patients with positive clinical cultures in the absence of disease                         | 111 (79)  |
| Would you like to prescribe AM in the following case scenarios?                                       |           |
| Clinical case 1   | 84 (60)   |
| Clinical case 2   | 35 (25)   |
| Clinical case 3   | 70 (50)   |

AM=Antimicrobial, AR=Antimicrobial resistance

**Attitude**

It is quite evident from our study that the students grossly overestimate the relative burden of AM resistance. The majority of students (90%) in our study have a positive attitude stating that they would like more clinical based training on antibiotic selection and prescribing. A high of 98% students in our study want pharmacology to be reinforced by discussing clinical-case based problems and 95% of medical students in our study responded positively for integrating the AM pharmacology teaching in the 2<sup>nd</sup> year with medicine posting for real time patient encounter. Classification of the medical students on the basis of poor (8–12), average (13–18) and good (19–24) attitude scores, our observations reflected 9, 13, and 78% of students in the respective categories.

**Table 2: Attitude of the students for antimicrobial stewardship**

| Questions  | Response n (%) |          |           |
|--|----------------|----------|-----------|
|  | Agree          | Disagree | Uncertain |
| Is there abuse on AM at present  | 140 (100)      | 0 (0)    | 0 (0)     |
| AM abuse is the leading cause of AR  | 140 (100)      | 0 (0)    | 0 (0)     |
| AR is not associated with increased mortality, morbidity and prolonged hospitalization             | 14 (10)        | 111 (79) | 15 (11)   |
| AS education has no significance for the UG medical students                                       | 3 (2)          | 137 (98) | 0 (0)     |
| AM pharmacology taught in 2nd year should be reinforced by discussing clinical-case based problems | 137 (98)       | 0 (0)    | 3 (2)     |
| AM pharmacology teaching should be integrated with medicine posting                                | 133 (95)       | 4 (3)    | 3 (2)     |
| New AM could be developed in future that will keep up with the problem of AR                       | 119 (85)       | 7 (5)    | 14 (10)   |
| Education of the nurses and pharmacists have no role in AS   | 77 (55)        | 42 (30)  | 21 (15)   |
| Would like further clinical based training on antibiotic selection and prescribing                 | 126 (90)       | 6 (4)    | 8 (6)     |

AM=Antimicrobial, AR=Antimicrobial resistance, AS=Antimicrobial stewardship, UG=Undergraduate

**Perception**

As reflected in table 3; majority of the students in our study were confident in making an accurate diagnosis of infection/sepsis (88%) and interpreting microbiological results (87%). Students were least confident in deciding to use combination therapy (47%) and deciding not to prescribe an antibiotic if the patient had fever alone or there was uncertainty in the diagnosis (48%). Classification of the medical respondents on the basis of poor (0–4), average (5–8), and good (9–12) perception scores indicated 18, 23, and 59% of students in the respective categories.

**Table 3: Perception of the students about their acquired knowledge and skills on antimicrobial prescribing**

| Questions  | Correct Response (n=140) n (%) |
|--|--------------------------------|
| Making an accurate diagnosis of infection/sepsis   | 123 (88)                       |
| Choose between intravenous and oral administration | 122 (87)                       |

|   |         |
|---|---------|
| Planning the duration of the antibiotic treatment   | 77 (55) |
| Choosing the correct dose and interval of administration  | 80 (57) |
| Planning to streamline/stop the antibiotic treatment according to microbiological results                     | 69 (49) |
| Using a combination therapy if appropriate  | 66 (47) |
| Deciding not to prescribe an antibiotic if the patient has fever and if you are not sure about your diagnosis | 67 (48) |
| Identify the scenarios where AM not required  | 69 (49) |
| Are you competent enough to select the best antimicrobial for the following diagnosis:                        |         |
| Community acquired pneumonia  | 80 (57) |
| Complicated UTI   | 60 (43) |
| Multi resistant Escherichia coli infection  | 28 (20) |
| Drug-resistant Salmonella Typhi   | 49 (35) |
| Drug-resistant tubercular infection   | 64 (46) |

AM=Antimicrobial, UTI=Urinary tract infection,

**Discussion**

Emergence and spread of antibiotic resistance is the biggest menace of 21<sup>st</sup> century. This has been accelerated by the misuse and overuse of antibiotics, as well as poor infection prevention and control. Hence, rational use of antimicrobials must be considered as an issue of patient safety and a great public health concern. In our study we have tried to evaluate the knowledge, attitude and perception (KAP) of medical undergraduates about antimicrobial (AM) prescribing.

The results of our study clearly reflect that the majority of the respondents have “good” knowledge about AM prescribing. In our study 92% of the respondents knew that prescribing broad spectrum AM is a fallacious practice contributing to AM resistance and that the narrow spectrum AM are equally effective.[12,13] As per the responses on clinical case based questions it was found that only 45% of the medical respondents scored “good” while the majority scored “average” and “poor”. These findings differ from another study where 39% of the respondents scored above average for the clinical scenario based questions.[14]

A previous study conducted with 2nd year UG students has emphasized the importance and advantages of the clinical case-based learning in Pharmacology teaching.[15] One of the biggest drawback in contemporary medical curriculum teaching pharmacology with simultaneous reinforcement through interactive discussion sessions and clinical problem based learning PBL for rational use of AM is the time constraint.[16] The majority of the UGs experience great hardships when they start their clinical practice. If the UGs are reinforced with clinical based learning right from the beginning of their curriculum, it will contribute towards rational use of AM and form the pedestal for successful AM stewardship.[17,18] In our study, 98% of the medical students had a positive attitude towards the AM stewardship; similar to the study of Huang *et al.* which highlights that 74% of the medical students favoured AM stewardship education in China.[19] The majority of the medical students believed that AM pharmacology teaching in the 2nd year should be integrated with medical postings (95%) and reinforced by problem based learning (98%). These results were in consistence with the previous study of Vasundara *et al.*[20]

The attitude of the respondents toward the statement that new AM could be developed in future to resolve the problem of AM resistance suggested that most of the students rely on new AM for solving the problems of AM resistance. However, inappropriate prescribing of AM known at present can pose serious AM resistance which would be difficult to tackle even with newer AM. On the other hand, almost 55% of the medical respondents were unaware of the importance of educating nurses and pharmacists in AM stewardship program. The results of our study on attitude and perception of the respondents further support the previous study of Davey *et al.* which highlighted the need to train the future prescribers about rational AM prescribing.[21] It is noteworthy that medical colleges in many countries such as the UK, the USA have revised their curricula for training good AM prescribing practices at the UG level.[1] Such initiatives of teaching AM use and choice of therapy through clinical case-based approach in the medical, dental, pharmacy and nursing curriculum should be taken up in India as well.

In our study the majority of students (90%) wanted further clinical based education on antibiotic prescribing. This finding is in

accordance with other studies of students and doctors. [4,3,8] Most students (88%) in our study felt confident in making an accurate diagnosis of infection; as misdiagnosis has been found to be a leading cause of unnecessary antibiotic use. [22] Vignette-based clinical scenario teaching with feedback has been found to be an effective method of promoting learning related to AM prescribing. [23] The students should also be taught how to communicate with patients in situations of diagnostic uncertainty, to reduce the number of unnecessary prescriptions. [1]

It was also revealed in our study that students consistently over-rated the prevalence of AM resistant. Majority of the students were aware of contributors to resistance, but a quarter of students felt that hand hygiene was not important. Highlighting the role of antibiotic stewardship programmes to help future doctors recognize that actions they take individually can collectively make a significant impact.

It was observed that the voluntary and unassisted participation of the students was the strength of our study resulting in actual reflection of KAP of the respondents. The antimicrobial stewardship program initiated by the department of pharmacology at our institute, on the other hand, may have affected the culture of antibiotic prescribing by our students.

### Conclusion

The observations made in our study prompt the need for introduction of certain academic interventions such as interactive discussion sessions, clinical case-based learning, integrating the AM pharmacology teaching with medicine posting for real time patient encounter with special emphasis on the irrational prescribing practices in which AM are not required or can be delayed safely for some time. Such educational interventions should be introduced at the 2nd year of UG curriculum to strengthen AM stewardship. This study also reflects the demand for additional clinical based education on AM prescribing. Larger studies with more robust methodology are required to further understand key educational interventions to support learning about antibiotic stewardship.

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Nil.

### Conflicts of Interest

There are no conflicts of interest.

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### References

- Pulcini C, Gyssens IC. How to educate prescribers in antimicrobial stewardship practices. *Virulence* 2013;4:192-202.
- Spellberg B. The antibiotic crisis: Can we reverse 65 years of failed stewardship? *Arch Intern Med* 2011;171:1080-1.
- WHO. The Evolving Threat of Antimicrobial Resistance: Options for Action. 2012. [http://whqlibdoc.who.int/publications/2012/9789241503181\\_eng.pdf](http://whqlibdoc.who.int/publications/2012/9789241503181_eng.pdf) (14 August 2013, date last accessed).
- Minen MT, Duquaine D, Marx MA et al. A survey of knowledge, attitudes, and beliefs of medical students concerning antimicrobial use and resistance. *Microb Drug Resist* 2010; 16: 285-9.
- Ibia E, Sheridan M, Schwartz R et al. Knowledge of the principles of judicious antibiotic use for upper respiratory infections: a survey of senior medical students. *South Med J* 2005;98: 889-95.
- Wright EP, Jain P. Survey of antibiotic knowledge amongst final year medical students. *J Antimicrob Chemother* 2004; 53: 550-1. 7. Humphreys H, Dillane T, O'Connell B et al. Survey of recent medical graduates' knowledge and understanding of the treatment and prevention of infection. *Ir Med J* 2006; 99: 58-9.
- Abbo L, Sinkowitz-Cochran R, Smith L et al. Faculty and resident physicians' attitudes, perceptions, and knowledge about antimicrobial use and resistance. *Infect Control Hosp Epidemiol* 2011; 32: 714-8.
- Ziglam HM, Morales D, Webb K et al. Knowledge about sepsis among training-grade doctors. *J Antimicrob Chemother* 2006; 57: 963-5.
- Pulcini C, Williams F, Molinari N et al. Junior doctors' knowledge and perceptions of antibiotic resistance and prescribing: a survey in France and Scotland. *Clin Microbiol Infect* 2011; 17: 80-7.
- Abbo LM, Cosgrove SE, Pottinger PS, Pereyra M, Sinkowitz-Cochran R, Srinivasan A, et al. Medical students' perceptions and knowledge about antimicrobial stewardship: How are we educating our future prescribers? *Clin Infect Dis* 2013;57:631-8.
- Sanchez GV, Roberts RM, Albert AP, Johnson DD, Hicks LA. Effects of knowledge, attitudes, and practices of primary care providers on antibiotic selection, United States. *Emerg Infect Dis* 2014;20:2041-7.
- Bowes J, Yassen AS 3rd, Barrowman N, Murchison B, Dennis J, Moreau KA, et al. Antimicrobial stewardship in pediatrics: Focusing on the challenges clinicians face. *BMC Pediatr* 2014;14:212.
- Rocha MC, Fiol F, Miranda F, Rocha J, Filho SB, Barreiros RC. Profile of prescribers and prescription of antibiotics in upper respiratory infections in pediatrics. *Rev Paul Pediatr* 2012;30:471-8.
- Gupta K, Arora S, Kaushal S. Modified case based learning: Our experience with a new module for pharmacology undergraduate teaching. *Int J Appl Basic Med Res* 2014;4:90-4.
- Dyar OJ, Pulcini C, Howard P, Nathwani D; ESGAP (ESCMID Study Group for Antibiotic Policies). European medical students: A first multicentre study of knowledge, attitudes and perceptions of antibiotic prescribing and antibiotic resistance. *J Antimicrob Chemother* 2014;69:842-6.
- MacDougall C, Polk RE. Antimicrobial stewardship programs in health care systems. *Clin Microbiol Rev* 2005;18:638-56.

- Sbarbaro JA. Can we influence prescribing patterns? *Clin Infect Dis* 2001;33 Suppl 3:S240-4.
- Huang Y, Gu J, Zhang M, Ren Z, Yang W, Chen Y, et al. Knowledge, attitude and practice of antibiotics: A questionnaire study among 2500 Chinese students. *BMC Med Educ* 2013;13:163.
- Vasundara K, Kanchan P, Pundarikaksha HP, Girish K, Prassana S, Jyothi R. An imperative need to change pharmacology curriculum: A pilot survey. *Indian J Pharmacol* 2010;42:420.
- Davey P, Garner S; Professional Education Subgroup of SACAR. Professional education on antimicrobial prescribing: A report from the Specialist Advisory Committee on Antimicrobial Resistance (SACAR) Professional Education Subgroup. *J Antimicrob Chemother* 2007;60 Suppl 1:i27-32.
- Pulcini C, Cua E, Lieutier F et al. Antibiotic misuse: a prospective clinical audit in a French university hospital. *Eur J Clin Microbiol Infect Dis* 2007; 26: 277-80.
- Prudent Antibiotic User. Standardized Teaching Materials for Prudent Antimicrobial Prescribing for Use in the Undergraduate Medical Curriculum. <http://www.pause-online.org.uk/?q=taxonomy/term/29> (14 August 2013, date last accessed).