

## ASSESSMENT OF KNOWLEDGE, ATTITUDE AND PRACTICE OF ANTIMICROBIAL USAGE AND RESISTANCE AMONG MEDICAL UNDERGRADUATES IN A TERTIARY CARE CENTRE: A CROSS-SECTIONAL STUDY

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### Abstract

**Background:** This was a cross-sectional study conducted in a tertiary care centre to assess the knowledge, attitude and practice regarding antimicrobial usage and resistance amongst medical undergraduates. **Materials and Methods:** A 15 itemed structured and validated survey tool (Questionnaire) was sent to medical undergraduates by sharing the google form link. Convenient sampling method was adopted for the study. Descriptive and inferential statistical analysis has been carried out in the present study. **Result:** A total of 300 medical undergraduate students participated in our study. Around 84% of students correctly responded that antibiotics are effective in bacterial infections. Majority of students (89.3%) knew that frequent and irrational antibiotic usage can lead to antibiotic resistance. Only half of our study participants (53.3%) demonstrated a good knowledge regarding the goals of antimicrobial stewardship programme. The participants were also asked; whether the doctors get influenced by pharmaceutical companies to prescribe antibiotics and around 37.7% of participants had a neutral opinion. Only 38% of students admitted in educating others regarding rational use of antibiotics. Likewise, only 19% of our students have participated in antibiotic awareness programs that focused on the spread of antibiotic resistance. **Conclusion:** Antibiotic resistance has become a global concern. Our medical undergraduates are future prescribers. Therefore, it is very crucial to mould them by giving proper training in responsible antibiotic usage and educating them regarding the disastrous consequences of antibiotic misuse or overuse.

## INTRODUCTION

In the absence of the development of new generation antimicrobials, appropriate use of existing antibiotics is a need to ensure the long-term availability of effective treatment for bacterial infections.<sup>[1]</sup> Antimicrobial resistance is a growing global health concern.<sup>[2,3]</sup>

Irrational prescription practices, Over the counter (OTC) availability of antibiotics, self-medication and unawareness regarding AMR has contributed to this worsening situation.<sup>[4]</sup> This havoc of antimicrobial resistance has led to longer stay in hospital and treatment with second line or third line drugs which are found to be more toxic and less effective.<sup>[5]</sup>

This context brings forth the importance of health care professionals; because they are the ones that play

a part in prescribing antibiotics; educating the public about the importance of adherence to therapies and avoidance of self-medication.<sup>[6]</sup> As we all know, our medical students are future prescribers. They are our frontline fighters against AMR. There are numerous studies, which show newly licensed doctors having inadequate antimicrobial prescribing behaviour.<sup>[7,8]</sup> Inadequate training during their student years may be the reason for their inability to undertake these tasks with certainty. In the light of growing antimicrobial resistance and the frequency in which these drugs are prescribed; “antimicrobial chemotherapy” should form an essential part in both the undergraduate and postgraduate medical curriculum.<sup>[9]</sup>

Therefore, before planning/ tailoring any suitable and effective curriculum, we must be aware of the baseline KAP of the target population. It was in this regard that this study was undertaken among

undergraduate medical students, in order to assess their knowledge and attitude concerning antibiotic resistance, as well as their practices related to antibiotic usage.

### **Objectives**

Primary objective: To determine the knowledge, attitude, and practice of medical undergraduates on usage of antimicrobial agents and antimicrobial resistance.

## **MATERIALS AND METHODS**

This was a descriptive, cross-sectional study with convenient sampling method conducted in a tertiary care centre in South India. The study was initiated after obtaining the approval from Institutional Ethical Committee (IEC). After obtaining informed consent, the questionnaire was distributed through google forms among the undergraduate medical students studying in Sree Narayana Institute of Medical sciences, Kerala.

### **Inclusion Criteria**

The study included undergraduate medical students between the age of 18 -26 years studying in Sree Narayana Institute of Medical Sciences, Kerala who were willing to participate and have filled the google form completely.

### **Exclusion Criteria**

Those undergraduate medical students who expressed unwillingness to participate in the study, who have not completed the google forms, and who have already participated in the pilot study were excluded from our study.

### **Study Tool**

A 15 itemed structured survey tool (Questionnaire) was developed after a literature review of comparable studies (6)(9)(10) and was validated by conducting a pilot study on a sample of 20 medical undergraduate students, who were finally excluded from the study. The questionnaire structure comprises of 4 sections.

- a. Demographic section
- b. Knowledge Section: It included closed ended questions designed to assess the participants' understanding of antibiotic usage and antibiotic resistance.
- c. Attitude section: This section included Likert scale questions or statements to explore the participants' attitudes and beliefs towards antibiotic usage and antibiotic resistance.
- d. The practice section aims to assess the participants' self-reported antibiotic usage behaviours.

### **Sample size calculation and Statistical analysis**

The sample size of 300 undergraduate medical students was calculated considering a proportion (p) of 93%, a relative precision (margin of error) of 3%, and a desired confidence level of 95%.

Descriptive and inferential statistical analysis has been carried out in the present study. Results on continuous measurements are presented on Mean, SD

(Min-Max) and results on categorical measurements are presented in Number (%). Significance is assessed at 5 % level of significance.

Chi-square/ Fisher Exact test has been used to find the significance of study parameters on categorical scale between two or more groups, Non-parametric setting for Qualitative data analysis. Fisher Exact test used when cell samples are very small.

The Statistical software namely SPSS 22.0, and R environment ver.3.2.2 were used for the analysis of the data and Microsoft word and Excel have been used to generate graphs, tables etc.

## **RESULTS**

A total of 300 undergraduate MBBS students participated in our study and completed the whole questionnaire. Among these participants, 78.3% were female and approximately 21.1% were male.

The participants were equally distributed across the different years of study as shown in [Table 1].

[Table 2] depicts the responses to questions related to knowledge of antibiotic usage and resistance. Overall, these students have shown adequate knowledge in majority of knowledge related questions items except question number 4. In our study 84% of students correctly responded that antibiotics are effective in bacterial infections. Majority of students (89.3%) knew that frequent and irrational antibiotic usage can lead to antibiotic resistance. It is encouraging to see that a significant proportion of students (approximately 86.3%) correctly recognized the need to improve antibiotic usage. Their understanding aligns with the fact that the misuse of antibiotics in one patient can indeed compromise the effectiveness of these drugs in treating infections in other patients. However, only half of our study participants (53.3%) demonstrated a good knowledge regarding the goals of antimicrobial stewardship programme. Notably, this finding was particularly evident among the final year students as shown in [Table 3].

Attitude of students in this regard was found to be adequate as shown in [Table 4]. Our study showed majority of students showing disagreement to the statement "the antibiotics should be taken whenever we get a common cold". Specifically, 45.3% of students disagreed with the statement, while an additional 27.3% strongly disagreed. The participants were also asked; whether the doctors get influenced by pharmaceutical companies to prescribe antibiotics and around 37.7% of participants had a neutral opinion. Based on the study participants, it appears that a significant portion of them hold the belief that misuse, or overuse of antibiotics can contribute to antibiotic resistance. More than half of the study participants (80.3%) felt it is necessary to implement Antimicrobial Stewardship programme in our hospital.

**Table 1: Year of study- Frequency distribution of patients studied**

Year of study	No. of Students (n)	%
Final Year Part 1	77	25.7
Final Year Part 2	75	25.0
First year MBBS	75	25.0
Second year MBBS	73	24.3
Total	300	100.0

**Table 2: Depicting Responses for Knowledge Based Questions**

Questions	Correct Response n(%)	Incorrect Response n(%)
Antibiotics are effective against.....	252 (84.0 %)	48 (16.0 %)
True about Antibiotics resistance	268 (89.3 %)	32 (10.7 %)
Why do we need to improve antibiotic use?	259 (86.3 %)	41(13.7%)
The goals of Antimicrobial Stewardship Programme.	160 (53.3 %)	140 (46.7%)
World Antibiotic awareness week is on	190 (63.3%)	110 (36.7%)

**Table 3: knowledge – frequency relation with year of study.**

Questions	Year of study				Correct Responses
	First Year n (%)	Second Year n(%)	Final Year Part1 n(%)	Final Year Part2 n(%)	
Antibiotics are effective against.....	66(22%)	60(20%)	62(20.7%)	64(21.3%)	252(84%)
True about Antibiotics resistance	30(10%)	60 (20%)	76(25.3%)	75 (25%)	268(89.3%)
Why do we need to improve antibiotic use?	11 (3.66%)	66 (22%)	85 (28.3%)	97 (32.3%)	259(86.3%)
The goals of Antimicrobial Stewardship Programme.	11 (3.66%)	20 (6.66%)	50 (16.7%)	79 (26.3%)	160 (53.3%)
World Antibiotic awareness week is on	39(13%)	52(17.3%)	45(15%)	54(18%)	190(63.3%)

**Table 4: Depicting Responses for Attitude based Questions**

Questions	Strongly Agree n(%)	Agree n(%)	Neutral n(%)	Disagree n(%)	Strongly Disagree n(%)
We should take antibiotics whenever we get common cold	5(1.7%)	27(9%)	50(16.7%)	136(45.3%)	82(27.3%)
It is not necessary to finish a course of antibiotics	16(5.3%)	10(3.3%)	14(4.7%)	64(21.3%)	196(65.3%)
Misuse / overuse of antibiotics cannot contribute to antibiotic resistance	11(3.7%)	10(3.3%)	6(2%)	113(37.7%)	160(53.3%)
You think the doctors don't get influenced by pharmaceutical companies to prescribe antibiotics.	2(0.7%)	23(7.7%)	111(37%)	137(45.7%)	27(9%)
I think, it is not necessary to implement Antimicrobial Stewardship programme in our hospital	19(6.3%)	14(4.7%)	26(8.7%)	105(35%)	136(45.3%)

**Table 5: depicting responses for practice based questions**

Questions	Yes n(%)	No n(%)
Have you ever bought antibiotics without doctor's prescription	196 (65.3%)	104 (34.7%)
Have u ever used leftover antibiotics at home	240(80.0%)	60(20.0%)
Have you ever shared your antibiotics with others	236(78.7%)	64 (21.3%)
Have you ever educated anyone about the rationale use of antibiotics	114 (38.0 %)	186 (62.0%)
Did you participate in antibiotic awareness programmes/campaigns to stop the further emergence and spread of antibiotic resistance?	57 (19 %)	243 (81.0%)

As seen in [Table 5], our medical students showed poor practice of antimicrobial usage. Most of our study participants (65.3%) had bought antibiotics without prescription; and 80% of them have used left over antibiotics at home. Only 38% of students admitted in educating others regarding rational use of antibiotics. Likewise, only 19% of our students have participated in antibiotic awareness programs that focused on the spread of antibiotic resistance.

## DISCUSSION

Antibiotics have paved the path for numerous medical developments that are indispensable in our health care system. Whatever modern medicine achievements we have today like major surgical procedures, cancer chemotherapy, organ

transplantations would not be have been possible without having an effective treatment of bacterial infections.<sup>[11]</sup> Unfortunately, resistance have been observed to nearly all antibiotics.<sup>[12]</sup> Currently our medical practice has been significantly affected by the emergence of Multi Drug Resistant and Pan drug resistant gram-negative bacilli.<sup>[13]</sup> At a global level, India carries one of the largest burdens of drug resistant pathogens, including highest burden of multidrug-resistant tuberculosis.<sup>[14]</sup> It is expected that India could witness two million deaths attributable to antimicrobial resistance (AMR) by the year 2050.<sup>[15]</sup> Therefore, antimicrobial resistance is an emergent concern, and it needs imminent action. As mentioned before, our future lies in the hands of young health care professionals. Only if we identify the gaps in their knowledge, attitude and practice in

antimicrobial usage and resistance; we would be able to take crucial steps that could promote rational antibiotic usage; thereby reducing antimicrobial resistance.

In our study, medical students have adequate knowledge regarding antibiotic usage and resistance. Many of our students were able to identify that antibiotics are not effective in viral and fungal infections. Similar observations were found in previous studies.<sup>[16,17]</sup>

We are aware that Antimicrobial stewardship program (ASP) is one of the fundamental methods that can help in reducing the prevalence of antimicrobial resistance.<sup>[18]</sup> However, in our study only half of the study participants could accurately respond to the knowledge question regarding antimicrobial stewardship. This points out the lack of training in ASP amongst undergraduate medical students. A study conducted by Singh et al; opines that despite the need for increasing awareness of ASP, there is no mandatory ASP programs in India.<sup>[19]</sup> Our study showed 35% disagreement and 45.3% strong disagreement to the statement “it is not necessary to implement Antimicrobial Stewardship programme in our hospital”. This shows the positive attitude towards the implementation of ASP programme in medical students.

There was a clear consensus amongst majority of our study participants; that misuse or overuse of antibiotics can contribute to antibiotic resistance. Similar findings have been reported by many studies.<sup>[6,16]</sup>

The influence of pharmaceutical marketing on drug prescriptions can negatively impact the prescription practice of health care professionals. In a study conducted in Nigeria, 87% of doctors prescribed antibiotics under the influence of pharmaceutical company.<sup>[20]</sup> In our study, approximately half of the study participants had a similar perspective. Furthermore, 37% of study participants had a neutral opinion regarding this matter. A major concern in India, is the practice of giving incentives to doctors by pharmaceutical companies for prescription of branded drugs. To tackle this issue, steps are being taken to promote the use of generic drugs nationwide.<sup>[21]</sup>

Despite study participants having adequate knowledge and a positive attitude towards antibiotic use, their self-reported practices regarding the use of antibiotics were found to be poor. Majority of our study participants used leftover antibiotics and bought antibiotics without doctor's prescription. Easy over-the counter availability of antibiotics is one of the main reasons behind these practices. All these poor practices can further worsen the existing problem of antibiotic resistance. Central Drugs Standard Control Organization in India, implemented Schedule H1 in 2014 with the aim of reducing / preventing over the counter sales of important antibiotics. The Schedule H1 list comprises 24 antibiotics and these antibiotics can only be sold with a prescription from a registered medical practitioner.

The pharmacists are required to maintain a separate register that includes the patient's name, contact details of the prescribing doctor, and the name and dispensed quantity of the antibiotic. This register should be kept for at least 3 years of duration and is subjected to government audits.<sup>[22]</sup> Red line campaign is another initiative launched by government of India to improve appropriate use of antibiotics. This initiative urges people to not use medicines with a bold red coloured line on the blister pack, like antibiotics without the advice of qualified prescribers.<sup>[23]</sup>

It is crucial, that we give more education and better training on antibiotic usage and resistance to young doctors during their undergraduate period. Timing of educating the importance of these issues is crucial, because once the doctors become qualified, it is very difficult to change their deep rooted views and behaviour.<sup>[24]</sup>

## CONCLUSION

Given the growing concern about antibiotic resistance, highlights the need for increased efforts to educate medical undergraduates about responsible antibiotic use and the consequences of misuse or overuse. Implementing more antibiotic awareness programs could help raise awareness and promote appropriate antibiotic stewardship among them.

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