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ORIGINAL RESEARCH

Knowledge, Attitude and Practice regarding antimicrobial usage amongst interns and medical undergraduate students of a tertiary care teaching hospital

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ABSTRACT

Introduction: Antimicrobial resistance is a serious global issue andirrational use of antimicrobial agents against infectious diseases is the main reason for the development of resistance. Containment of antimicrobial resistance requires change in the antimicrobial prescribing behavior of health workers.WHO has recommended training for medical students regarding the prudent prescription of antibiotics. **Aim and Objective:** To determine the knowledge, attitudes, and practices of medical students and interns regarding the use of antimicrobials. **Material and methods:** It was a cross-sectional observational study conducted in department of Pharmacology of Shri Guru Ram Rai Institute of Medical and Health Sciences (SGRRIM & HS) Dehradun. Medical undergraduate students from second year to final year and interns were included in the study. Informed consent was obtained from each participant. A pretested, validated google form questionnaire was used in this study. Comparison of quantitative variables between the study groups was done using ANOVA. For comparing categorical data, Chi square ($\chi 2$) test was performed and fisher exact test was used when the expected frequency is less than 5. **Results:** A total of 416 responses were included in the study.The results revealed that interns have better knowledge compared to other MBBS students. The ANOVA test indicated a statistically significant difference in the knowledge score between student groups ($F = 9.05$, $p = 0.001$).Only59.9% of students and interns had correctly answered the question related to use of antibiotics in treatment of diarrhea and viral fever.Additionally, 87% of participants agreed with the statement emphasizing the importance of large-scale 'antimicrobial awareness programs' for spreading information about these medications.It is worth noting that a majority (80%, n=333) always check for expiry dates before using any antimicrobial product. **Conclusion:** The study sheds light on the existing gaps in the knowledge, attitude, and practice of antimicrobial use among interns and medical students.Targeted interventions and educational initiatives that aim to foster responsible antimicrobial prescribing behavior and mitigate the growing threat of antimicrobial resistance must be the part of medical education. Antimicrobial knowledge should beimparted as integrated approach and should be considered as a certifiable skill for the successful completion of internship.

Keywords: KAP survey, medical undergraduate, interns, antimicrobial resistance, antibiotic usage

Key Message: The present study was conducted to assess the knowledge, attitude and practice of undergraduate students regarding antimicrobial usagerevealed that students were aware of the fact that injudicious use can lead to antimicrobial resistance. However, study also highlightedtheexisting gap in knowledge regarding the use especially in treatment of common cold and diarrhea. The attitude of medical students regarding skipping of antibiotics was found to be negative and one third considered skipping of dose will not impact antimicrobial resistance and they stopped the treatment in between once they feel better. As these students will be future prescribers, it is crucial for us to address this issue through interactive and holistic learning and teaching approach.

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INTRODUCTION

The discovery of antimicrobials, although serendipitous, was an important milestone in the history of medicine. Unfortunately, in a remarkably short period of time antibiotic resistance started emerging since antimicrobials were misused by the health care providers and the community[1]. Antimicrobial resistance is a global issue and one of the major health problems in developing countries like India where relatively easy availability and higher consumption leads to disproportionately higher levels of antibiotic resistance[2].India has the highest infectious disease burden in the world and consequently antimicrobials play a critical role in limiting morbidity and mortality[3].

A recent report revealed that the inappropriate and irrational use of antimicrobial agents against infectious diseases has led to an increase in the development of antimicrobial resistance[4]. Only the extent and percentage of antibiotic resistance varies from country to country but the underlying problem of antimicrobial misuse and resistance remains the same globally[5,6].

Containment of antimicrobial resistance requires change in the antimicrobial prescribing behavior of health workers. The widespread inappropriate use of antimicrobials is considered as one of the important significant causes of the development of microbial antibiotic resistance[7-9].These facts have prompted many to call for improvements in the way doctors' prescribe antimicrobials to patients[10-11].The extent of the doctors' knowledge on antimicrobial use has been identified as a key factor that affects individual prescribing behavior[12].

The medical students will be tomorrow's doctor and will write the prescription for the patients.WHO has recommended training for medical students regarding the prudent prescription of antibiotics[13].The use of antimicrobials is a critical aspect of medical practice, and it is essential for medical students and interns to have a sound knowledge of the antimicrobials[14]. This knowledge enables them to make informed decisions when prescribing medications and contributes to effective patient care[12]. Additionally, having a proper attitude towards the use of antimicrobials is crucial to avoid overuse or misuse, which can contribute to the development of antimicrobial resistance.

Taking in consideration the role of future prescribers i.e. medical students along with doctors in improving the current scenario of antimicrobial use and antimicrobial resistance the present study was designed to gain a deeper understanding of the knowledge, attitudes, and practices of medical students and interns regarding the use of antimicrobials. This will help to develop targeted interventions and educational initiatives that aim to foster responsible antimicrobial prescribing behavior and mitigate the growing threat of antimicrobial resistance.

Objective

To determine the knowledge, attitudes, and practices of medical students and interns regarding the use of antimicrobials**.**

MATERIAL AND METHOD

The study was conducted in the department of Pharmacology in SGRRIM&HS, Dehradun. The protocol was approved by the Institutional Ethics Committee. It was a cross-sectional observational study in which interns and medical undergraduate students of SGRRIMS& HS from second year to final year were included. Informed consent was obtained from each participant. The study was approved by the institutional ethics committee (Reference number: SGRR/IEC/15/23 dated 15/07/2023).

A pretested, validated google form questionnaire was used in this study. The questionnaire was divided into the following sections.

1. Demographic Information The questionnaire collected demographic information from the participants, such as their age, gender, and year of study
2. Knowledge, Attitude and Practice about importance of antimicrobials and misuse resulting in antimicrobial resistance (closed questions)
3. Suggestions on possible ways to solve the problem of antimicrobial resistance (open ended question)

   A common scoring method was used for this KAP questionnaire as follows- 1 (one) point for correct and 0 (zero) for an incorrect answer in the knowledge section.

Sample size calculation:

Statistical Analysis

Data were described in terms of range; mean ±standard deviation (± SD), frequencies (number of cases) and relative frequencies (percentages) as appropriate. Comparison of quantitative variables between the study groups was done using ANOVA. For comparing categorical data, Chi square ($\chi 2$) test was performed and fisher exact test was used when the expected frequency is less than 5. A probability value (p value)less than 0.05 was considered statistically significant. All statistical calculations were done using (Statistical Package for the Social Science) SPSS 21.0 version (SPSS Inc., Chicago, IL, USA) statistical program for Microsoft Windows.

RESULTS

The present study assessed the knowledge, attitude and practice regarding the Use of antimicrobials amongst the Interns and medical students. A total of 416 responses were included in the study. The demographic details of the respondents are shown in Figure1. The study included 244 female participants, representing 58.7% of the total, and 170 male participants, accounting for 40.9%, while 2 students (0.5%) opted not to disclose their gender.

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Demographic characteristics of the participants

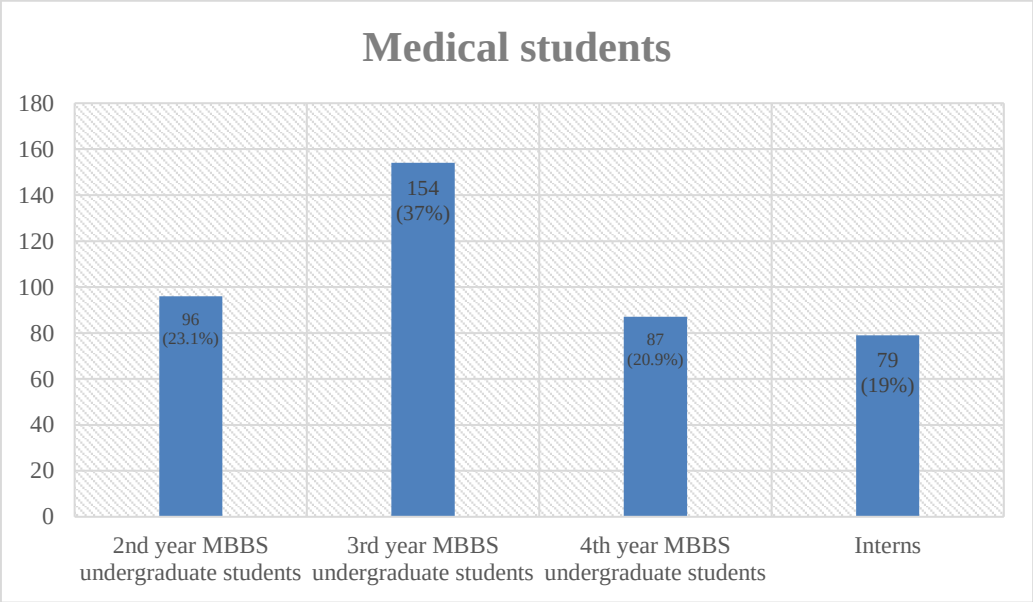

Figure 1: Year Wise distribution of medical students

Assessment of knowledge

A total of 11 questions were asked to assess the knowledge of the respondents. Correct response was received by 93.7% for question antibacterial can cure viral infection. Common cold, cough and diarrhea are always bacterial in nature were correctly answered by 386 of total respondents with a range of 83.8 % to 96.2%. Only 59.9% of students and interns had given a correct response for the question;All patients with diarrhea require antimicrobial medicines.

Table1: Correct response for knowledge-based questions

Knowledge based questions	2nd year MBBS (n=96)	3rd year MBBS (n=154)	4th year MBBS (n=87)	Intern (n=79)	Total
1. Antibiotic and antimicrobial are the same thing	82 (85.4%)	118 (76.6%)	69 (79.3%)	62 (78.5%)	331
2. Antimicrobials can cure bacterial infections.	61 (63.5%)	116 (75.3%)	65 (74.7%)	58 (73.4%)	300
3. Antibacterials can cure viral infections.	87 (90.6%)	139 (90.3%)	81 (93.1%)	74 (93.7%)	381
4. Common cold, cough and diarrhea are always bacterial in nature.	84 (87.5%)	129 (83.8%)	79 (90.8%)	76 96.2%	368
5. All patients with diarrhea require antimicrobial medicines.	37 (38.5%)	87 (56.5%)	67 (77.0%)	58 (73.4%)	249
6. If medically appropriate, IV antibiotics should be stepped down to an oral alternative wherever possible	57 (59.4%)	111 (72.1%)	58 (66.7%)	67 (84.8%)	293
7. The efficacy and safety of newer and costlier antimicrobials is always better than the existing alternatives.	49 (51.0%)	60 (39.0%)	40 (46.0%)	45 (57.0%)	194
8. Indiscriminate and injudicious antimicrobial use can lead to antimicrobial resistance.	80 (83.3%)	131 (85.1%)	79 (90.8%)	74 (93.7%)	364
9. Antimicrobial Resistance is an important and serious global public health issue.	84 (87.5%)	143 (92.9%)	83 (95.4%)	76 (96.2%)	386
10. Our institute has antibiotic stewardship committee	44 (45.8%)	76 (49.4%)	71 (81.6%)	44 (55.7%)	235
11. Use of antimicrobial medicine	73 (76.0%)	117 (76.0%)	74 (85.1%)	62	326

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can be improved with availability of local antibiogram or prescription auditing.				(78.5%)	

Table 2: Comparison of mean score of knowledge

Participants	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum	F	p-value
				Lower Bound	Upper Bound				
Interns	80.09	14.49	1.63	76.85	83.34	27.27	100.00	9.905	0.001
3rd year MBBS students	69.89	15.57	1.59	66.73	73.04	27.27	100.00		
2nd year MBBS students	72.43	17.09	1.38	69.71	75.15	18.18	100.00		
4th year MBBS students	80.04	16.63	1.78	76.50	83.59	27.27	100.00		
Total	74.89	16.69	0.82	73.28	76.50	18.18	100.00		

The mean and standard deviation were calculated for each year of medical students and interns as shown in table 3. The results revealed that interns have better knowledge compared to other MBBS students. ANOVA test indicated a statistically significant difference in the knowledge score between student groups ($F = 9.05$, $p = 0.001$). 65.8% of interns had scores more than 50% in comparison to 2nd year MBBS students

Assessment of attitude

Attitude towards antimicrobial usage was evaluated by asking participants to rate their level of agreement (5-point scale)on eight statements related to the use and effects of antimicrobials. In table 3, shown that almost one third of the study population (37.1%) believed that antimicrobials are the primary treatment for common cold, cough, and diarrhea. Additionally, 87% of participants agreed with the statement emphasizing the importance of large-scale 'antimicrobial awareness programs' for spreading information about these medications. Furthermore, half of respondents (55.1%) concurred with prescribing prophylactic antimicrobial agents once a patient is admitted to prevent hospital-acquired infections (% agreed + strongly agreed).

Table 3: The attitude of participants about the usage of antimicrobials

Attitude based questions (Response: Agree+ Strongly agree)	2nd year MBBS (n=96	3rd year MBBS (n=154)	4th year MBBS (n=87)	Interns (n=79)	Total (n=416)
1. Antimicrobials are commonly prescribed because of their safety	45 (46.9%)	87 (56.5%)	46 (53.4%)	36 (45.5%)	214 (51.4%)
2.Skipping one or two doses does not contribute to the development of antimicrobial resistance	32 (33.4%)	48 (31.1%)	33 (37.9%)	22 (27.8%)	135 (32.45%)
3. Adverse effects of antimicrobials are always reduced by using more than one antimicrobial at a time	26 (27.1%)	37 (24%)	38 (43.6)	20 (25.4%)	121 (29.08%)
4. Antimicrobials are the first line of drugs to treat common cold, cough and diarrhea	46 (48%)	59 (38.3%)	29 (33.3%)	21 (26.6%)	155 (37.25%)
5.In all infections, use of antimicrobials shortens the duration of illness	37 (38.6%)	57 (37%)	41 (47.1%)	31 (39. 24%)	166 (39.9%)
6. Large-scale ‘antimicrobial awareness programmes’ are important to spread information about antimicrobials	87 (90.7%)	134 (87.1%)	69 (79.3%)	72 (91.1%)	362 (87.01%)
7. Once patient is admitted to hospital, it is better to prescribe	63 (65.7%)	84 (54.6%)	51 (58.6%)	48 (60.7%)	246 (59.13%)

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prophylactic antimicrobial agents to prevent hospital acquired infection					
8. For admitted patients it is better to use parenteral broad spectrum antimicrobial agent	55 (57.3%)	79 (51.3%)	50 (57.4%)	43 (54.4%)	227 (54.67%)

Assessment of Practice

In the present study, a total of eight questions were asked to assess the practice of medical students and interns. The responses from participants were recorded using a four-point Likert scale (always, usually, sometime and never) as shown in Table 4 and 5. Only 55% (n=229) of respondents reported never stopping treatment after taking 2-3 doses of antibiotics once they felt better. Additionally, it was found that 63% of the study population stated that they complete the full course of antimicrobial treatment. Moreover, 40.1% reported using the same antimicrobial purchased directly from the pharmacist (always %+ usually). It is worth noting that a majority (80%, n=333) always check for expiry dates before using any antimicrobial product.

Table 4: Participant's antimicrobial use practices

Practice based questions	Response	2nd year MBBS (n=96)	3rd year MBBS (n=154)	4th year MBBS (n=87)	Intern (n=79)	Chi-square value	p-value
1. The Doctor prescribes a course of antibiotic for you. After taking 2–3 doses you start feeling better. a) Do you stop taking the further treatment	Always	6 (6.3%)	12 (7.8%)	6 (6.9%)	6 (7.6%)	17.876	0.037
	Never	67 (69.8%)	72 (46.8%)	41 (47.1%)	49 (62.0%)		
	Sometime	13 (13.5%)	40 (26.0%)	21 (24.1%)	13 (16.5%)		
	Usually	10 (10.4%)	30 (19.5%)	19 (21.8%)	11 (13.9%)		
1.b) Do you complete the full course of treatment?	Always	64 (66.7%)	94 (61.0%)	53 (60.9%)	55 (69.6%)	13.423	0.144
	Never	2 (2.1%)	0 (0.0%)	2 (2.3%)	0 (0.0%)		
	Sometime	9 (9.4%)	16 (10.4%)	9 (10.3%)	13 (16.5%)		
	Usually	21 (21.9%)	44 (28.6%)	23 (26.4%)	11 (13.9%)		
1. c) 20 c) Do you buy the same antibiotics directly from pharmacy next time when you get sick with similar symptoms?	Always	7 (7.3%)	9 (5.8%)	11 (12.6%)	6 (7.6%)	6.392	0.700
	Never	30 (31.3%)	45 (29.2%)	18 (20.7%)	19 (24.1%)		
	Sometime	31 (32.3%)	51 (33.1%)	28 (32.2%)	27 (34.2%)		
	Usually	28 (29.2%)	49 (31.8%)	30 (34.5%)	27 (34.2%)		
1. d)Do you suggest the same antibiotics to your friend/roommate if they get sick with similar symptoms?	Always	7 (7.3%)	7 (4.5%)	9 (10.3%)	5 (6.3%)	10.95	0.304
	Never	28 (29.2%)	45 (29.2%)	14 (16.1%)	17 (21.5%)		
	Sometime	32 (33.3%)	55 (35.7%)	28 (32.2%)	30 (38.0%)		
	Usually	22 (22.9%)	43 (27.9%)	23 (26.4%)	20 (25.3%)		

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Table 5: Participant's response on antimicrobial use practices

Practice based questions	Response	2nd year MBBS (n=96)	3rd year MBBS (n=154)	4th year MBBS (n=87)	Intern (n=79)	Chi-square value	p-value
2. Do you increase the dose of antimicrobial during the course of treatment if symptoms not subsiding for faster recovery.	Always	1 (1.0%)	8 (5.2%)	5 (5.7%)	6 (7.6%)	14.127	0.118
	Never	52 (54.2%)	62 (40.3%)	32 (36.8%)	38 (48.1%)		
	Sometime	30 (31.3%)	46 (29.9%)	27 (31.0%)	22 (27.8%)		
	Usually	13 (13.5%)	38 (24.7%)	23 (26.4%)	13 (16.5%)		
3. If symptoms do not subside within 2-3 days, it is better to change the antimicrobial agent.	Always	10 (10.4%)	25 (16.2%)	10 (11.5%)	8 (10.1%)	18.304	0.032
	Never	5 (5.2%)	12 (7.8%)	18 (20.7%)	12 (15.2%)		
	Sometime	37 (38.5%)	57 (37.0%)	32 (36.8%)	32 (40.5%)		
	Usually	44 (45.8%)	60 (39.0%)	27 (31.0%)	27 (34.2%)		
4. Do you check the expiry date of the antimicrobial agent before using it?	Always	80 (83.3%)	126 (81.8%)	61 (70.1%)	66 (83.5%)	11.403	0.249
	Never	3 (3.1%)	2 (1.3%)	2 (2.3%)	0 (0.0%)		
	Sometime	6 (6.3%)	8 (5.2%)	11 (12.6%)	5 (6.3%)		
	Usually	7 (7.3%)	18 (11.7%)	13 (14.9%)	8 (10.1%)		
5.Do you need a prescription for buying an antimicrobial agent from pharmacy?	Always	31 (32.3%)	34 (22.1%)	19 (21.8%)	23 (29.1%)	9.508	0.392
	Never	11 (11.5%)	25 (16.2%)	12 (13.8%)	17 (21.5%)		
	Sometime	32 (33.3%)	52 (33.8%)	33 (37.9%)	19 (24.1%)		
	Usually	22 (22.9%)	43 (27.9%)	23 (26.4%)	20 (25.3%)		

DISCUSSION

The present questionnaire-based study was conducted to assess the level of knowledge, attitude and practice on antimicrobial use amongst medical students and interns. A total of 416 respondents participated, and their responses were recorded using a Google form. Primary analysis on aggregated knowledge scores showed a mean score of 74.89 among study participants. Interns had higher scores compared to 2nd, 3rd, and 4th year MBBS students, which was also statistically significant. Based on the survey results, it is evident that there are misconceptions and gaps in knowledge regarding antimicrobial use among medical students and interns.

A similar cross-sectional study was conducted in which 221 medical students excluding interns were enrolled and where awareness about the antimicrobial resistance was 90-100%. In another study 181 students (interns and 1st year PG residents) were included to participate in the questionnaire survey on students' knowledge, attitude and practice toward antibiotic usage. Another concern that emerges from the literature is that medical students can struggle to understand simple concepts of effectiveness of antibiotics in treating viral infections and the misconception that antibiotics are safe to use, despite well-documented evidence of their potential adverse effects and contribution to secondary infections[15-16].

One important area to highlight is knowledge about the use of antibiotics in the treatment of diarrhea. In India, the most common cause of diarrhea is viral in nature, which usually does not require antibiotics and can be easily treated with fluid replacement through oral rehydration therapy[3]. When we assessed their knowledge, only 59.9% of participants correctly answered about the antibiotic requirement in treatment of diarrhea.These finding are consistent with the previous studies where students had misconceptions regarding the use of antimicrobial in viral infection and diarrhoea[17-19].The erroneous concept of using antibiotics in sore throat regardless the bacterial or viral origin was also highlighted in the study where final year medical sector students were included[20].

It is evident from the study that there are misconceptions and gaps in knowledge among

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medical students and interns regarding the appropriate use of antibiotics, especially in the treatment of diarrhea and viral infections. There was also a knowledge deficit regarding the safety and efficacy of newer antibiotics. More than half of respondents believed that newer antibiotics are always safer and more efficacious than existing therapies. Interdisciplinary collaboration can provide comprehensive education and awareness about the appropriate use of antibiotics in the treatment of diarrhea and viral infections[12].

In our hospital, we have established an antibiotic stewardship committee aimed at addressing this important issue of antibiotic resistance. However, a concerning finding was revealed as more than half of 2nd year and 3rd year MBBS students were not aware of its existence.This issue was also highlighted by the recent study in which phase II and Phase III students were included[21].It is crucial to engage medical students in hands-on experiences and clinical rotations that emphasize the importance of antimicrobial stewardship.

The study revealed that the majority of participants considered large-scale 'antimicrobial awareness programs' important for spreading information about antimicrobials. In a similar study, respondents reported they would like more education on appropriate use of antimicrobials (90%) and on antimicrobial resistance (79%)[22].

The attitude of medical students regarding skipping of antibioticswas found to be negative and one third considered skipping of dose will not impact antimicrobial resistance and they stopped the treatment in between once they feel better. Similar findings were seen in a study conducted in the southern part of India where the attitude of medical students were laxed regarding antimicrobial usage[23].

Self-medication of antibiotics (SMA) another important issue and factor for antimicrobial resistance.Our study revealed high proportions of students use the same antibiotic when they have similar symptoms and also recommend the same antibiotic to the roommate. They also increase the dose for faster recovery or change the antibiotic for if symptoms not subsided in 2-3 days. Similar findings were seen in a study where self-medication with antibiotics was as high as 60.8%[24].

As these students will be future prescribers, it is crucial for us to address this issue and work towards finding sustainable solutions. We must involve our MBBS students and interns in drug and therapeutic committees, and antibiotic stewardship committee.E-learning platforms, workshops and certified courses should be added as integrated teaching which provide case-based learning for treatment of different infections. Knowledge of antibiotics should be assessed in all the phases of MBBS. Judicious use of antimicrobial should be added like AETCOM module in MBBS curriculum and 15 days compulsory posting in infection control unit in internship.

CONCLUSION

In conclusion, the study sheds light on the existing gaps in the knowledge, attitude, and practice of antimicrobial use among interns and medical students. By recognizing these shortcomings and implementing targeted educational and behavioral interventions, we can strive towards cultivating a cohort of healthcare professionals who are well-equipped to combat antimicrobial resistance and deliver optimal patient care.

Conflict of interest: none

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