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Assessment of Knowledge, Attitude and Practice Towards Antibiotics among Medical and Dental Students in Indian University: A Cross-Sectional Study

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Abstract

Background: Inappropriate use of antibiotics contributes to global antimicrobial resistance. Evaluating knowledge, attitudes, and practices (KAP) among university students who are future prescribers can improve antibiotic use. **Objectives:** This study assesses the KAP of antibiotics among medical and dental students in India, aiming to identify educational gaps to better combat antimicrobial resistance. **Materials and Methods:** A cross-sectional questionnaire-based study was conducted among 400 medical and dental university students, following the approval from Institutional Ethics Committee. Students willing to participate were included. Pilot study on 30 students ensured questionnaire's reliability (Cronbach's alpha: 0.82). Data were analyzed using SPSS with Pearson's chi-square test for KAP factor relationships and Mann Whitney U test for comparing KAP between students. A p-value of less than 0.05 was considered statistically significant. **Results :** 232 (58%) medical and 168 (42%) dental students participated. 80.49% medical students demonstrated significantly higher knowledge [median, Interquartile range 16(15,18)] than 73.9% dental students [median, Interquartile range 15(13,17)] (p:0.001, z:4.96). 82.29% medical and 80.72% dental students responded correctly to the attitude section, indicating strong awareness about responsible antibiotic use. Practice dimension showed correct responses from 72.34% (medical) and (72.12%) dental students, emphasizing the need to better apply knowledge and attitudes in practice. Overall, 77.2% of participants exhibited adequate knowledge, 81.5% displayed positive attitude and 72.23% engaged in good practices. **Conclusions:** These findings suggest revising curricula and implementing targeted programs, particularly for dental students, to enhance antibiotic knowledge. Practical, behavior-focused education, antimicrobial stewardship, and targeted interventions are essential for future prescribers. Further research with larger populations is needed to generalize these practices across healthcare.

Keywords: Antibiotics; AntiMicrobial resistance; KAP; Dentistry; Medicine; Prescribers

1 Introduction

Antibiotics are indispensable in the fight against infections, but their widespread misuse and inappropriate prescribing create major challenges. This has resulted in development of resistance towards antibiotics leading to treatment failure, increases in length of hospital stay, higher healthcare costs, morbidity, and mortality.[1–4] Antibiotic resistance is a growing concern in India and has become a significant public health issue. The misuse of antibiotics and weak infection control practices have given rise to drug-resistant bacteria. Common bacteria like *Escherichia coli*, *Staphylococcus aureus*, and *Klebsiella pneumoniae* are increasingly resistant to multiple antibiotics, making infections harder to treat and increasing the risk of treatment failure. The extensive use of antibiotics for diseases like tuberculosis, acute febrile illness and diarrheal illnesses only makes the problem worse.[5]

Medical and dental students play a key role in addressing this issue. They are future healthcare professionals who need a solid grasp of antibiotic use and resistance. Students also learn about infection control measures, such as proper hand hygiene, to prevent the spread of resistant bacteria within the healthcare settings. While the medical students learn the basics of antibiotics such as proper dosing and treatment duration and indications, there are gaps in their understanding. Many students lack in-depth knowledge about the mechanisms of resistance and the consequences of misuse, highlighting a need for better educational programs. Improvements in educational content, better supervision, and the use of technology to assist with decision-making are all important steps in bridging this gap. In the field of dentistry, antibiotics are frequently used, especially for managing infections related to root canals. However, research indicates that many of these infections can be treated effectively with local interventions, such as drainage and root canal therapy, without resorting to antibiotics.[6] Guidelines also recommend avoiding antibiotics for non-spreading dental infections in otherwise healthy individuals.[7] Despite this, past studies show that dental students and professionals often lack sufficient knowledge about appropriate antibiotic use.[8–10]

Addressing antibiotic misuse requires a multifaceted approach. Strategies include updating antibiotic formularies, enhancing education, implementing feedback systems, and promoting rational use of antibiotics. Research into the knowledge, attitudes, and practices (KAP) of medical and dental students is crucial. Conducting a comprehensive evaluation of knowledge, attitudes, and practices (KAP) among a representative sample of university students can serve as an effective tool to enhance the appropriate utilization of antibiotics. KAP studies are easy to carry out, measurable, and understandable. Previous studies conducted in India and other countries have pointed out significant gaps in their understanding and practice, emphasizing the need for improved training and education.[11–13] However, limited KAP studies have been carried in Northern India on university students towards antibiotics.[14] This study was therefore aimed to assess the knowledge, attitude, and practice towards antibiotics among medical and dental university students in Northern India. By identifying and addressing these shortcomings among prospective prescribers, the research hopes to enhance antibiotic stewardship and support global efforts to combat resistance.

2 Material & Methods

- **Study Design:** Cross-sectional and observational study.
- **Study Setting:** Medical and dental college of SGT University in Northern India.
- **Sample Size:** Sample size was calculated using G power software (version 3.1.9.7). Based on calculated effect size 0.18, 5% level of precision, 95% confidence level and 80% power of study, the sample size was found to be 396, which was rounded off as 400.
- **Study Duration:** 4 months.
- **Ethical Considerations:** Ethical clearance was obtained from the Institutional Ethics Committee (IEC), registered by CDSCO, MOHFW and DHR, ICMR according to ICMR/GCP guidelines (IECS-GTCHRI/SGTCOLLEGEOFPHARMACY/2023/03). Informed consent (included in the questionnaire) was taken from the participants prior to study.
- **Inclusion Criteria:** Final year students, interns, and post graduate students from dental and medical department of the university who were willing to participate and consented for the study were included.
- **Exclusion Criteria:** Students from dental and medical department in their first, second and third year were excluded from the study. Students who refused to participate were also excluded.
- **Data Collection:** Data was collected using a questionnaire adapted from previously published studies to meet our research objectives.[15,16] To ensure the questionnaire's reliability and validity, a pilot study involving 30 students was conducted. The reliability of the questionnaire was assessed using the alpha-Cronbach's coefficient, yielding a value of 0.82. The questionnaire was divided into four sections. The first section included 4 questions aimed at gathering demographic information about the participants. The second section contained 20 questions to assess the participants' knowledge of antibiotics, with 12 questions presented in a Yes/No format. The third section consisted of 16 questions focusing on the participants' attitudes toward antibiotics, with 4 Yes/No questions. The final section had 7 questions related to the participants' practices concerning antibiotic use. An electronic version of the questionnaire was emailed to approximately 500 students. To minimize information and selection bias, instructors encouraged students to complete it during class. A total of 400 students responded, resulting in a response rate of 80%.
- **Data Analysis:** The responses to questions were coded with numeric value. For each correct answer of sections related to KAP questionnaire, "1" score was given and for each incorrect answer, "0" score was given. "1" score was given to the positive responses: "I've heard the term and I can explain what it is", "I've used the term before", and "I use the term in everyday practice" and a score of "0" was assigned for negative responses: "I've never heard of it" and "I've heard the term but I'm not sure what it is". 5-point Likert scale was used for options ranging from strongly disagree "1" to strongly agree "5". Each participant's total score was calculated by summing the values of their responses. Scores >80% indicated an adequate/good/positive response, scores between 60% and 80% indicated a sufficient/fair/positive response, and scores below 60% indicated an inadequate/poor/negative response for each domain.[15,17]
- **Statistical Analysis:** Data was analyzed using SPSS version 28 IBM CORP software. Continuous variables were presented with mean + SD. Categorical variables were expressed as frequencies and percentages. Pearson's chi-square test or Fisher's exact test was used to determine the relationship between factors related to KAP as predictors. Mann Whitney U test was applied for comparison of KAP between medical and dental students where $p < 0.05$ was considered statistically significant.

3 Results

400 students participated in the study, including 232(58%) students from medicine and 168(42%) from dentistry. Out of 232 medicine participants, 230 (99.2%) were MBBS students and 2 (0.8%) were MD students. Out of 168 dentistry participants, 147 (87.5%) were BDS students and 21 (12.5%) were MDS students.

Table 1 shows the socio-demographic characteristics of students of medicine and dentistry. There was a significant difference of gender and place of living between the participants of medicine and dentistry.

Table 2 shows the responses in percent (%) obtained from the participants of medicine and dentistry to the knowledge component of the questionnaire. Out of 400 participants, 309 (77.2%) participants showed adequate knowledge while 91 (22.8%) had inadequate knowledge. Mann Whitney U test indicated that correct responses were significantly higher in 322 (80.5%) participants of medicine indicating adequate knowledge of students of medicine with median 16 (interquartile range 15, 18) than 296 (74%) participants of dentistry, indicating sufficient knowledge of students of dentistry, with median 15 (interquartile range 13, 17), ($p<0.05$, z - value 4.96). Our results were comparable to a previous study, where out of 400 respondents, 250 (62.5%) showed adequate knowledge, while 150 (37.5%) had inadequate knowledge.[16]

Further, we tried to find out the association between genders with responses to the knowledge dimension of the questionnaire. It was found that out of the total female participants of dentistry, 1 (0.59%) had poor knowledge, 40 (23.8%) had inadequate knowledge and 84 (50%) had adequate knowl-

Table 1. Socio-demographic characteristics of students of Medicine and Dentistry

Sociodemographic characteristics of participants		Medicine	Dentistry	X^2 value	P value	Total
		n* (%)	n* (%)			n* (%)
Gender	Male	122 (53)	43 (25)	29.29	0.0001	165 (42)
	Female	110 (47)	125 (65)			235 (58)
Place of living	With parents	95 (40.9)	88 (52.3)	13.79	0.008	183 (45.8)
	In University Hostel	79 (34.05)	37(22.02)			116 (29)
	In Rented Apartment	16 (6.8)	22 (13.09)			38 (9.5)
	In a paying guest accommodation	25 (10.77)	11 (6.5)			36 (9)
	In own Apartment	17 (7.32)	10 (5.9)			27 (6.7)
If family member is a health care worker?	Yes	127 (55)	102 (61)	1.42	0.233	229 (57)
	No	105 (45)	66 (39.2)			171 (43)

*n represents number of participants, Pearson X^2 test applied, $p < 0.05$ considered statistically significant.

edge, whereas for male participants of dentistry, 1 (0.59%) had poor knowledge, 12 (7.14%) had inadequate knowledge and 30 (17.85%) had adequate knowledge. Out of the total female participants of medicine, 1 (0.43%) had poor knowledge, 12 (5.17%) had inadequate knowledge and 97 (41.81%) had adequate knowledge, whereas for male participants of medicine, 2 (0.86%) had poor knowledge, 17 (7.32%) had inadequate knowledge and 103 (44.39%) had adequate knowledge. Chi square test revealed no association between gender and knowledge dimension of the questionnaire for both dental and medical respondents (p value of 0.66 and 0.68 respectively).

Table 3 shows the responses in percent (%) obtained from the participants of medicine and dentistry to the attitude component of the questionnaire.The percentage of correct answers to 16 questions were 329 (82.25%) and 323 (80.75%) by the participants of medicine and dentistry respectively. The median value for both the participants of medicine and dentistry was found to be 11 (interquartile range 10, 12) indicating positive attitude towards antibiotics. Using the Mann Whitney U test, it was found that there was no significant difference between the attitude of participants of medicine and dentistry (p = 0.223, z value 1.22). Our result showed that out of 400 participants, 326 (81.5%) participants showed positive attitude, while 78 (19.5%) showed negative attitude.

Table 4 shows the response obtained from participants of medicine and dentistry in the practice dimension towards antibiotics. Results indicated correct responses by 168 (72.41%) participants of medicine and 121 (72.12%) participants of dentistry to 7 questions. The median value of practice towards antibiotics for participants of medicine was 5 (interquartile range 3, 5) and for participants of dentistry was also 5 (interquartile range 4, 5). Mann Whitney U test showed no statistical difference between the practices of participants of medicine and dentistry (p = 0.844, z - value 0.2). Overall, from 400 respondents, 289 (72.23% participants) showed good practices, while 111 (27.77%) showed poor practices. The results of our study contrasted with a previous study.[15]

4 Discussion

A comprehensive KAP evaluation among future prescribers can enhance rational antibiotic use. The significant difference in knowledge between medical and dental students underscores the need for improved awareness and curriculum updates, especially in Dental sciences. Many participants from both the disciplines mistakenly believed antibiotics could treat viral infections and common ailments like the common cold reflecting a gap in understanding that contributes to antimicrobial resistance. Students across MBBS, BDS, and MDS programs must be aware of these fundamentals as they will address a range of conditions in clinical practice. There was clearly difference in the familiarity between the students of medicine and dentistry about the essential terms related to antibiotics such as antimicrobial resistance, superbugs, daily defined dose, etc. which necessitates the incorporation of additional training on antibiotics to future prescribers in their respective curriculum. Most of the dental students were unaware of anti-microbial stewardship. Antimicrobial stewardship is a key concept that should be emphasized in the education of future prescribers.

Table 2. Knowledge of students of Medicine and Dentistry towards antibiotics

S.no	Questions asked to participants with their responses		Medicine n* (%)	Dentistry n* (%)	X^2 value	P value	Total n* (%)
1	Can Antibiotics cure bacterial infections?	Yes	232 (100)	166 (99)	2.78	0.095	398 (99.5)
2	Can Antibiotics cure viral infections?	No	158 (68)	114 (68)	-	-	272 (68)
3	Antimicrobial Resistance means when bacteria overcome antibiotics?	Yes	219 (94.4)	159 (95)	0.01	0.92	378 (94.5)
4	Common cold symptoms need antibiotic treatment?	No	193 (83.1)	107 (64)	19.76	0.001	300 (75)
5	Antibiotics decrease fever?	No	196 (84.4)	147 (87.5)	0.73	0.393	343 (85.8))
6	Antibiotics decrease pain?	No	225 (97)	154 (92)	5.54	0.0189	379 (94.8)
7	Antibiotics overcome malaise and fatigue?	No	195 (84)	148 (88)	1.3	0.254	343 (85.8)
8	Combination of antibiotics prevent antimicrobial resistance?	Yes	192 (82.7)	161 (96)	16.06	0.001	353 (88.2)
9	Antibiotic resistance is due to insufficient knowledge about their use	Yes	218 (94)	152 (90)	1.71	0.191	370 (92.5)
10	Antibiotic resistance result from their inappropriate use outside the prescriber's prescription?	Yes	219 (94.4)	160 (95)	0.14	0.708	379 (94.8)
11	Skipping doses of antibiotics contribute to antibiotic resistance?	Yes	161 (69.4)	119 (71)	0.1	0.752	280 (70)
12	Newer and costly antibiotics have better efficacy?	No	131 (56.5)	150 (90)	50.22	0.0001	281 (70.3)
13	Are you familiar with the term Antibiotic resistance?	I've never heard of it	5 (2)	29 (17.2)	38.36	0.001	34 (8.5)
		I've heard the term but I'm not sure what it is	23 (10)	30 (17.8)			53 (13.2)
		I've heard the term and I can explain what it is	182 (78)	93 (55.3)			275 (68.8)
		I've used the term before	22 (9.5)	16 (9.5)			38 (9.5)
14	Are you familiar with the term Superbugs?	I've never heard of it	23 (10)	38 (22.6)	32.21	0.001	61 (15.25)
		I've heard the term but I'm not sure what it is	72 (31)	73 (43.4)			145 (36.25)
		I've heard the term and I can explain what it is	111 (48)	54 (32.1)			165 (41.25)
		I've used the term before	26 (11)	3 (1.7)			29 (7.25)

Continued on next page

Table 2 continued

15	Are you familiar with the term Bacterial resistance against antibiotics?	I've never heard of it	3 (1.3)	7 (4.1)	9.89	0.0195	10 (2.5)
		I've heard the term but I'm not sure what it is	18 (7.8)	26 (15.4)			44 (11)
		I've heard the term and I can explain what it is	193 (83.1)	125 (74.4)			318 (79.5)
		I've used the term before	18 (7.5)	10 (5.9)			28 (7)
16	Are you familiar with the term Drug resistance?	I've never heard of it	5 (2)	12 (7.1)	14.31	0.002	17 (4.25)
		I've heard the term but I'm not sure what it is	22 (10)	24 (14.2)			46 (11.5)
		I've heard the term and I can explain what it is	161 (69)	117 (69.6)			278 (69.5)
		I've used the term before	44 (19)	15 (8.9)			59 (14.75)
17	Are you familiar with the term Antibiotics Stewardship Program (ASP)?	I've never heard of it	34 (15)	86 (51.1)	70.55	0.0001	120 (30)
		I've heard the term but I'm not sure what it is	69 (30)	40 (23.8)			109 (27.25)
		I've heard the term and I can explain what it is	83 (36)	35 (20.8)			118 (29.5)
		I've used the term before	44 (19)	6 (3.5)			50 (12.5)
		I am engaged in everyday practice	2 (1)	1 (0.5)			3 (0.75)
18	Are you familiar with the term Defined Daily Dose (DDD)?	I've never heard of it	4 (1.8)	17 (10.1)	32.71	0.0001	21 (5.25)
		I've heard the term but I'm not sure what it is	31 (13.3)	43 (25.5)			74 (18.5)
		I've heard the term and I can explain what it is	156 (67.2)	98 (58.3)			254 (63.5)
		I've used the term before	34 (14.6)	8 (4.7)			42 (10.5)
		I am engaged in everyday practice	7 (3)	2 (1.1)			9 (2.25)
19	Are you familiar with the term Days of Therapy (DOT)?	I've never heard of it	4 (1.7)	16 (9.5)	45.66	0.0001	20 (5)
		I've heard the term but I'm not sure what it is	24 (10.3)	48 (28.5)			72 (18)
		I've heard the term and I can explain what it is	157 (67.6)	90 (53.5)			247 (61.75)
		I've used the term before	42 (18.1)	9 (5.3)			51 (12.75)
		I am engaged in everyday practice	5 (2.1)	5 (2.9)			10 (2.5)
20	Are you familiar with the term Antibiogram?	I've never heard of it	25 (10.7)	30 (17.8)	19.86	0.001	55 (13.75)
		I've heard the term but I'm not sure what it is	78 (33.6)	69 (41)			147 (36.75)
		I've heard the term and I can explain what it is	88 (37.9)	62 (36.9)			150 (37.5)
		I've used the term before	35 (15)	6 (3.5)			41 (10.25)
		I am engaged in everyday practice	6 (2.5)	1 (0.5)			7 (1.75)

*n represents number of participants, Pearson X^2 test applied, $p < 0.05$ considered statistically significant. Only correct response indicated for Yes / No questions.

Table 3. Attitude of students of Medicine and Dentistry towards antibiotics

S.no	Questions asked to participants with their responses		Medicine	Dentistry	X^2	P	Total
			n* (%)	n* (%)			n* (%)
1	Today, is antibiotic resistance an important and serious global public health issue?	Yes	227 (97.8)	162 (96.4)	0.73	0.393	389(95%)
2	Antimicrobial Resistance is a serious public health issue in India.	Strongly disagree	7 (3)	4 (2.3)	4.63	0.327	11(2.7%)
		Disagree	6 (2.6)	5 (2.9)			11(2.7%)
		Neither agree or not disagree	18 (7.7)	17 (10.1)			35(8.7%)
		Agree	112 (48.2)	64 (38)			176(44%)
		Strongly agree	89 (38.4)	78 (46.4)			167(41.7%)
3	What are the perceived causes of antibiotic resistance in India?	Overuse in hospitals	29 (12.5)	24 (14.2)	49.04	0.001	53(13.2%)
		Overuse in community	143 (61.6)	51 (30.3)			194(48.5%)
		Overuse in animals	1 (0.4)	0 (0)			1(0.2%)
		Incorrect dosing/duration	51 (21.9)	85 (50.5)			136(34%)
		Improper regulations	4 (1.7)	3 (1.7)			7(1.7%)
		Improper hospital infection control	1 (0.4)	3 (1.7)			4(1%)
		Inadequate diagnostic support	2 (0.8)	0 (0)			2(0.5%)
		Inadequate immunization	0 (0)	1 (0.5)			1(0.2%)
		Poor quality of antimicrobials	1 (0.4)	1 (0.5)			2(0.5%)
4	Do you think that the more antibiotic we use in society, the higher is the risk that resistance develops and spreads?	Yes	221 (95.2)	159 (94.6)	0.08	0.777	380(95%)
5	Should pharmaceutical companies, in your opinion, develop new antibiotics?	Yes	226 (97.4)	161 (95.8)	0.77	0.38	387(96.7%)
6	What do you think about the extent of antimicrobial resistance in your facility (Hospital)?	Minor Problem	130 (56)	85 (50.5)	1.16	0.281	215(53.7%)
		Major Problem	102 (43.9)	83 (49.4)			185(46.2%)
7	Antibiotics are over used in your facility (hospital)	Strongly disagree	6 (2.5)	3 (1.7)	14.53	0.006	9(2.2%)
		Disagree	27 (11.6)	8 (4.7)			35(8.7%)
		Neither agree or not disagree	84 (36.2)	90 (53.5)			174(43.5%)
		Agree	107 (46.1)	61 (36.3)			168(42%)
		Strongly agree	8 (3.4)	6 (3.5)			14(3.5%)
8	Cost of an antibiotic must be considered before prescription.	Strongly disagree	9 (3.8)	5 (2.9)	10.6	0.031	14(3.5%)
		Disagree	23 (9.9)	11 (6.5)			34(8.5%)
		Neither agree or not disagree	59 (25.4)	30 (17.8)			89(22.2%)
		Agree	122 (52.5)	115 (68.4)			237(59.2%)
		Strongly agree	19 (8.1)	7 (4.1)			26(6.5%)
9	By limiting use of antibiotics, good patient care would be impaired.	Strongly disagree	6 (2.5)	0 (0)	68.89	0.001	6(1.5%)
		Disagree	18 (7.7)	18 (10.7)			36(9%)
		Neither agree or not disagree	56 (24.1)	103 (61.3)			159(39.7%)
		Agree	132 (56.8)	36 (21.4)			168(42%)
		Strongly agree	20 (8.6)	11 (6.5)			31(7.7%)
10	There is a need to establish education programs on rational use of antibiotics in my Facility (hospital).	Strongly disagree	2 (0.8)	2 (1.1)	2.55	0.636	4(1%)
		Disagree	14 (6)	5 (2.9)			19(4.7%)
		Neither agree or not disagree	27 (11.6)	17 (10.1)			44(11%)
		Agree	163 (70.2)	126 (75)			289(72.2%)
		Strongly agree	26 (1.2)	18 (10.7)			44(11%)

Continued on next page

Table 3 continued

11	There is a need to establish an antibiotics policy in your facility (hospital) to achieve rational antibiotic usage.	Strongly disagree	4 (1.7)	1 (0.5)	6.41	0.171	5(1.2%)
		Disagree	8 (3.4)	3 (1.7)			11(2.7%)
		Neither agree or not disagree	14 (6)	18 (10.7)			32(8%)
		Agree	187 (80.6)	126 (75)			313(78.2%)
		Strongly agree	19 (8.1)	20 (11.9)			39(9.7%)
12	Which method do you prefer the most to provide education on antibiotic use for health care professionals?	Official Curriculum in undergraduate school (Medical/Dental College etc)	34 (14.6)	18 (10.7)	19.92	0.001	52(13%)
		Internal training programs offered by the facility	58 (25)	30 (17.8)			88(22%)
		CME programs offered by national professional organizations	68 (29.3)	86 (51.1)			154(38.5%)
		Educational workshops offered by international professional organizations	65 (28)	30 (17.8)			95(23.7%)
		E-learning programs Web-based infectious disease case consultations	7 (3)	4 (2.3)			11(2.7%)
13	Antimicrobial Resistance (AMR) should be addressed as a multi-sectoral issue that requires the collaboration of diverse partners.	Legislative body	40 (17.2)	7 (4.1)	75.72	0.001	47(11.7%)
		Policy Makers	91 (39.2)	19 (11.3)			110(27.5%)
		Pharmaceutical society	15 (6.4)	38 (22.6)			53(13.2%)
		Pharmaceutical Companies	72 (31)	89 (52.9)			161(40.2%)
		Internal Medicine Association	8 (3.4)	8 (4.7)			16(4%)
		Society of Infectious Diseases	4 (1.7)	2 (1.1)			6(1.5%)
		Others	2 (0.8)	5 (2.9)			7(1.7%)
14	The development of local/national antibiotic use guidelines is perceived to be more useful than using international ones	Strongly disagree	4 (1.7)	0 (0)	15.73	0.003	4(1%)
		Disagree	8 (3.4)	6 (3.5)			14(3.5%)
		Neither agree or not disagree	72 (31)	28 (16.6)			100(25%)
		Agree	138 (59.4)	120 (71.4)			258(64.5%)
		Strongly agree	10 (4.3)	14 (8.3)			24(6%)
15	Antibiotic guidelines and antibiotic stewardship are of help in clinical care.	Strongly disagree	3 (1.2)	1 (0.5)	5.33	0.255	4(1%)
		Disagree	1 (0.4)	3 (1.7)			4(1%)
		Neither agree or not disagree	16 (6.8)	19 (11.3)			35(8.7%)
		Agree	186 (80.1)	123 (73.2)			309(77.2%)
		Strongly agree	26 (11.2)	22 (13)			48(12%)
16	There is need to establish to establish course "Rational use of antibiotics" at the university level.	Yes	230 (99.1)	160 (95.2)	6.08	0.013	390(97.2%)
		No	2 (0.9)	8 (4.7)			10(2.5%)

*n represents number of participants, Pearson X^2 test applied, $p < 0.05$ considered statistically significant. Only correct response indicated for Yes / No questions.

Table 4. Practice of students of Medicine and Dentistry towards antibiotics

S. No	Questions asked to participants with their responses		Mn (%)	Dn (%)	X^2 value	P value	Total n (%)
1	Your prescription of antibiotics is influenced by the patients' demand for antibiotics.	Strongly disagree	84 (36.2)	39 (23.2)	13.43	0.009	123(30.7)
		Disagree	83 (35.7)	90 (53.5)			53(43.2)
		Neither agree or not disagree	19 (8.1)	12 (7.1)			7(7.7)
		Agree	40 (17.2)	24 (14.2)			14(16)
		Strongly agree	6 (2.5)	3 (1.7)			1(2.2)
2	Your prescription of antibiotics is influenced by the availability of the antibiotics than by the cause of diseases.	Strongly disagree	28 (12)	19 (11.3)	5.74	0.219	211(11.7)
		Disagree	112 (48.2)	77 (45.8)			45(47.2)
		Neither agree or not disagree	45 (19.3)	46 (27.3)			27(22.7)
		Agree	38 (16.3)	24 (14.2)			14(15.5)
		Strongly agree	9 (3.8)	2 (1.1)			1(2.7)
3	Bacterial confirmation and sensitivity report must be provided before antibiotic prescription.	Strongly disagree	1 (0.43)	1 (0.5)	3.6	0.463	30(0.5)
		Disagree	7 (3)	4 (2.3)			2(2.7)
		Neither agree or not disagree	27 (11.6)	13 (7.7)			7(10)
		Agree	165 (71.1)	133 (79.1)			79(74.5)
		Strongly agree	32 (13.7)	17 (10.1)			10(12.2)
4	If patients' medical conditions allow, IV antibiotics will be changed to oral form within 2-3 days.	Strongly disagree	2 (0.8)	1 (0.5)	4	0.406	40(0.7)
		Disagree	8 (3.4)	1 (0.5)			0(2.2)
		Neither agree or not disagree	29 (12.5)	20 (11.9)			11(12.2)
		Agree	166 (71.5)	128 (76.1)			76(73.5)
		Strongly agree	27 (11.6)	18 (10.7)			10(11.2)
5	How frequently do you require help in selecting antibiotics?	Never	9 (3.8)	8 (4.7)	16.29	0.001	54(4.2)
		Sometimes	129 (55.6)	63 (37.5)			37(48)
		Most of the time	73 (31.4)	85 (50.5)			50(39.5)
		Always	21 (9)	12 (7.1)			7(8.2)
6	Which sources of information do you turn to while selecting antibiotics?	Internet-based sources	8 (3.4)	6 (3.5)	59.5	0.001	63(3.5)
		National/international antimicrobial guidelines	89 (38.3)	24 (14.2)			14(28.2)
		Drug formulary / journal / textbook	59 (25.4)	102 (60.7)			60(40.2)
		Local hospital guidelines	21 (9)	7 (4.1)			4(7)
		Peers/senior colleagues	44 (18.9)	17 (10.1)			10(15.2)
		ID specialists / microbiologists / clinical pharmacologists	7 (3)	7 (4.1)			4(3.5)
		Others	4 (1.7)	5 (2.9)			2(2.2)
7	How frequently does a senior colleague recommend an antibiotic different from your choice?	Not sure	51 (21.9)	17 (10.1)	13.62	0.003	710(17)
		Never	9 (3.8)	16 (9.5)			9(6.2)
		Sometimes	135 (58.1)	104 (61.9)			61(59.7)
		Almost always	37 (15.9)	31 (18.4)			18(17)

*n represents number of participants, Pearson X^2 test applied, $p < 0.05$ considered statistically significant.

Antimicrobial stewardship programs have gained traction in India, but there is a continued need for structured training through conferences, workshops, and continuing medical education (CMEs). This includes practices such as de-escalation (switching to narrower-spectrum antibiotics when appropriate), judicious use of combination therapy, and exploring non-antibiotic alternatives whenever possible.[18]Results further established lack of association between sociodemographic characters and knowledge dimension of the questionnaire among respondents, indicating that educational improvements should be universally applied.

The respondents of both medicine and dentistry showed similar attitude towards antibiotics and agreed to the fact that antimicrobial resistance being a serious problem globally, in India as well as in their facility and strongly recommended the need to establish educational programs and implementation of antibiotics policy at various level for rational use of antibiotics, individually as well as collectively. However, there was a noticeable difference in attitudes towards cost considerations, with medical students more attuned to selecting cost-effective drugs, which could help to reduce the economic burden of patients.

Similar positive trend toward judicious antibiotic practices among the participants of medicine and dentistry was observed, with students generally avoiding antibiotic prescriptions based on patient demand and focusing on bacterial identification and sensitivity tests. Medical students favored national or international guidelines, while dental students relied more on textbooks and drug formularies. However, the need and difference for seeking help from senior colleagues in selecting antibiotics between participants of medicine and dentistry recommends raising the practical knowledge of dental students.

Engaging university students with practicing and academic pharmacists can further improve their knowledge, attitudes, and practices regarding antibiotics. Educational interventions have proven effective in enhancing these areas, and similar approaches should be adopted to better prepare future prescribers.[19]

Limitations

Our study has some limitations. Being cross-sectional in nature, it may not cover long-term changes in attitudes and practices. The sample size was limited to willing participants from a single university, suggesting the need for larger, multi-university studies. Additionally, socially desirable responses might introduce bias, a common issue in self-reporting questionnaire studies.

5 Conclusion

Antibiotic resistance is a critical global issue, akin to a pandemic. The assessment of knowledge, attitude, and practices towards antibiotics among future prescribers can strongly impact the issues related to antibiotics. Our study highlights significant differences between the knowledge of participants of medical and dental sciences, suggesting the need for revised curriculum, educational and awareness programs for dental students. While both the groups showed positive attitude and fair clinical practices, there is a need for enhanced training on prudent antibiotic use. Further evidence-based studies involving clinicians catering to larger sections of population are required for generalizing the actual clinical practice towards antibiotic use.

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