

An Examination of the Understanding, Perceptions, and Behaviors Related to Antibiotic Usage and Antimicrobial Resistance Among University Students in South Gujarat

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Abstract—Background: The improper use of antibiotics has contributed significantly to the emergence of antimicrobial resistance (AMR), a significant worldwide public health concern. As future professionals and powerful members of society, university students are a crucial demographic for evaluating antibiotic usage awareness and habits. The current study's objectives were to evaluate South Gujarat university students' knowledge, attitudes, and behaviors about antibiotic usage and antimicrobial resistance, as well as to look at how these factors related to their academic fields.

Methods: 401 students from a private institution in South Gujarat, India, participated in cross-sectional analytical research. Data on sociodemographic traits and knowledge, attitude, and practice (KAP) about antibiotic usage and AMR were gathered using a standardized, self-administered questionnaire. Students were divided into two groups: non-medical (science and administration) and medical and paramedical (pharmacy, nursing, and ayurveda). The data was summarized using descriptive statistics, and relationships between field of study and KAP levels were evaluated using the chi-square test, with a significance threshold of $p < 0.05$.

Result: Most students showed low to moderate understanding of the usage of antibiotics and antimicrobial resistance. Knowledge ($p = 0.045$) and attitude ($p < 0.001$) were shown to be statistically significantly correlated with field of study, with medical and paramedical students showing more knowledge and more favorable attitudes than non-medical students. The topic of study and antibiotic-related habits, however, did not significantly correlate ($p = 0.134$). Both groups often engaged in inappropriate behaviors including self-medication and early antibiotic termination.

Conclusion: University students frequently used antibiotics inappropriately, even if medical and

paramedical students had better attitudes and understanding. These results emphasize the necessity of thorough, university-wide behavioral and instructional initiatives to reduce antimicrobial resistance and encourage sensible antibiotic usage.

Index Terms—Antimicrobial Resistance, Anti-Bacterial Agents, Drug Utilization, Knowledge, Attitudes, and Practice, Students

I. INTRODUCTION

One of the most popular medications in the world, antibiotics are essential for treating bacterial illnesses. However, the increasing worldwide issue of antimicrobial resistance (AMR), which jeopardizes the efficient prevention and treatment of infectious illnesses, has been further exacerbated by the improper use of antibiotics. AMR has become a significant public health concern, especially in low- and middle-income nations like India where antibiotics are commonly overused and readily available.

Studies on knowledge, attitude, and practice (KAP) are frequently used to evaluate public attitudes and practices about the use of antibiotics and antimicrobial resistance. As future professionals and powerful members of society, university students make up a significant target demographic for these kinds of evaluations. Previous research has demonstrated that university students worldwide frequently have misunderstandings about the use of antibiotics, such as using them for viral illnesses or stopping therapy too soon (Akbar et al., 2021; Jairoun et al., 2019).

Numerous studies conducted in the Indian setting have brought attention to medical and allied health students' incorrect antibiotic usage practices and knowledge gaps. Undergraduate students in North India were found to have modest levels of understanding regarding self-medication and incomplete antibiotic courses, yet they continued to engage in improper behaviors (Bharti et al., 2020; Gupta et al., 2019).

Similar disparities in antibiotic-related knowledge and practices between health science and non-health science students have been documented in studies from various Asian nations. Research from China and Thailand shows that students studying health-related subjects often have a greater understanding of AMR, although improper behaviors are still common among students from all academic backgrounds (Min et al., 2022; Precha et al., 2024).

Therefore, the goal of the current study was to evaluate South Gujarat university students' knowledge, attitudes, and behaviors about antibiotic usage and antimicrobial resistance, as well as to investigate their relationship to their field of study.

II. METHODOLOGY

Study design and setting

Students at a private institution in South Gujarat, India, participated in cross-sectional analytical research. The purpose of the study was to evaluate university students from various academic fields' knowledge, attitudes, and practices regarding antibiotic usage and antimicrobial resistance.

Study population and sample size

Standard techniques for determining a population proportion were used to establish the sample size for the current investigation. Since the precise frequency of adequate information and suitable behaviors regarding antibiotic usage among university students was unknown, a 95% confidence level was taken into consideration with an assumed percentage of 0.5. A 5% margin of error was used to guarantee sufficient accuracy.

A target sample size of about 400 students was deemed adequate, taking into account the 8,000 total students at the chosen private institution in South Gujarat and accounting for any non-response. As a

result, information was gathered from 401 students, all of whom were part of the final study.

Sampling technique

A stratified random sampling technique was employed to ensure representation from different academic disciplines. Students were stratified based on their field of study, and participants were selected proportionately from each stratum.

For analytical purposes, academic disciplines were categorized into:

- Medical and paramedical students (Pharmacy, Nursing, and Ayurveda)
- Non-medical students (Science and Management)

This categorization was applied consistently across all analyses to enable meaningful subgroup comparisons.

Data collection tool

A systematic, self-administered questionnaire based on earlier KAP research on antibiotic usage and antimicrobial resistance was used to gather data. There were four sections to the questionnaire:

- Sociodemographic data (age, gender, place of residence, academic discipline, and family history in healthcare)
- Items measuring knowledge of antibiotic indications, antibiotic resistance, the repercussions of overuse, and preventative actions were included in the knowledge section. Statements evaluating attitudes and beliefs about antibiotic usage, resistance, and ethical antibiotic practices were included in the attitude section.
- The practice part evaluated self-reported antibiotic-related behaviors, such as self-medication, following recommended treatment plans, and consultation procedures.

III. ETHICAL CONSIDERATIONS

The study was conducted in accordance with all ethical guidelines. The relevant university authorities granted prior authorization to carry out the study. All participants gave their informed consent prior to data collection, and participation was entirely voluntary. Participants were informed of the study's goal, and the anonymity and confidentiality of the data they submitted were rigorously upheld. The information

was only utilized for research, and no personally identifiable information was gathered.

Inclusion criteria

- Students currently enrolled in the university
- Students who provided informed consent

Exclusion criteria

- Incomplete or inconsistent responses were excluded at the item level without altering the official sample size.

IV. RESULT

Table 1. Socio-demographic characteristics of the study participants (n = 401)

Variable	Category	n	%
Age (years)	17–19	248	61.8
	20–22	134	33.4
	23–25	8	2
	26–28	4	1
Gender	Female	275	68.6
	Male	118	29.4
Residence	Urban	198	49.4
	Rural	118	29.4
	Semi-urban	75	18.7
Field of study	Medical & Paramedical	278	69.3
	Non-medical	116	28.9
Family member in healthcare field	Yes	128	31.9
	No	266	66.3

Table 2. Knowledge regarding antibiotic use and antimicrobial resistance among students by field of study (n = 401)

Knowledge level	Medical & Paramedical (n = 278)	Non-medical (n = 123)	Total (n = 401)
Poor	118 (42.4%)	53 (43.1%)	171 (42.6%)
Moderate	125 (45.0%)	44 (35.8%)	169 (42.1%)
Good	35 (12.6%)	26 (21.1%)	61 (15.2%)

According to Table 2, most students knew little to nothing about the usage of antibiotics and antimicrobial resistance. The percentage of students with high knowledge remained low overall, despite the fact that medical and paramedical students showed substantially superior knowledge than non-medical students.

Table 3. Attitude towards antibiotic use and antimicrobial resistance among students by field of study (n = 401)

Attitude level	Medical & Paramedical (n = 278)	Non-medical (n = 123)	Total (n = 401)
Negative	16 (5.8%)	23 (18.7%)	39 (9.7%)
Neutral	62 (22.3%)	21 (17.1%)	83 (20.7%)
Positive	200 (71.9%)	79 (64.2%)	279 (69.6%)

According to Table 3, the majority of students had a favorable opinion on antibiotic usage and antimicrobial resistance. Medical and paramedical students were more likely than non-medical students to have positive views, whereas non-medical students were more likely to have negative attitudes.

Table 4. Practice regarding antibiotic use and antimicrobial resistance among students by field of study (n = 401)

Practice level	Medical & Paramedical (n = 278)	Non-medical (n = 123)	Total (n = 401)
Poor	64 (23.0%)	37 (30.1%)	101 (25.2%)
Moderate	98 (35.3%)	32 (26.0%)	130 (32.4%)
Good	116 (41.7%)	54 (43.9%)	170 (42.4%)

As per Table 4, Less than half of the students showed appropriate habits regarding the use of antibiotics and antimicrobial resistance. Students from both non-medical and medical/paramedical backgrounds showed poor and moderate practices, demonstrating unsafe antibiotic-use habits regardless of academic specialty.

Table 5. Association between field of study and knowledge regarding antibiotic use & AMR (n = 401)

Knowledge level	Medical & Paramedical	Non-medical	Total	χ^2 (df=2)	p-value
Poor	118	53	171	6.21	0.045
Moderate	125	44	169		
Good	35	26	61		
Total	278	123	401		

Table 5 demonstrates a statistically significant correlation ($p < 0.05$) between the field of study and awareness of antimicrobial resistance and antibiotic usage. When compared to non-medical students, medical and paramedical students showed greater levels of sufficient knowledge, demonstrating the impact of academic exposure on antibiotic-related knowledge.

Table 6. Association between field of study and attitude towards antibiotic use & AMR (n = 401)

Attitude level	Medical & Paramedical	Non-medical	Total	χ^2 (df=2)	p-value
Negative	16	23	39	18.74	< 0.001
Neutral	62	21	83		
Positive	200	79	279		
Total	278	123	401		

Table 6 shows that attitudes on antibiotic usage and antimicrobial resistance are extremely significantly correlated with the field of study ($p < 0.001$). Compared to non-medical students, medical and paramedical students had more favorable views, indicating a higher level of understanding and concern about the negative effects of improper antibiotic usage.

Table 7. Association between field of study and practice regarding antibiotic use & AMR (n = 401)

Practice level	Medical & Paramedical	Non-medical	Total	χ^2 (df=2)	p-value
Poor	64	37	101	4.02	0.134
Moderate	98	32	130		
Good	116	54	170		
Total	278	123	401		

As per table 7, There is no statistically significant correlation ($p > 0.05$) between the field of study and antibiotic-related activities. This implies that acceptable antibiotic-use procedures were not consistently adhered to all academic fields, despite variations in knowledge and attitudes.

V. DISCUSSION

This study evaluated South Gujarat university students' knowledge, attitudes, and behaviors about antibiotic usage and antimicrobial resistance and looked at how these factors connected to their academic fields. The results offer valuable insights into how academic background affects antibiotic usage awareness and behavior.

Understanding of the usage of antibiotics and antimicrobial resistance

The current study showed a statistically significant correlation between awareness level about antibiotic usage and antimicrobial resistance and the field of study. When compared to non-medical students, medical and paramedical students demonstrated more knowledge. Similar results have been seen among college students in India and other nations, with healthcare-related students often being exposed to more ideas about antibiotics and resistance through their academic programs (Bharti et al., 2020; Gupta et al., 2019).

In spite of this, there were very few students in both groups who had strong knowledge. Studies on medical students in China and India have revealed similar gaps, suggesting that even health science students continue to have misunderstandings about antibiotic indications and resistance processes. (Gupta et al., 2019; Min et al., 2022).

Attitude towards antibiotic use and antimicrobial resistance

The field of research and attitudes toward antimicrobial resistance and antibiotic use were shown to be extremely significantly correlated. Compared to non-medical students, medical and paramedical students showed more favorable sentiments, indicating a higher worry about the negative effects of using antibiotics inappropriately. Positive attitudes have been linked to greater understanding of AMR as a public health concern among healthcare students in Saudi Arabia and Thailand. (Akbar et al., 2021; Precha et al., 2024).

However, as attitudes have a significant impact on antibiotic demand and self-medication behavior, the unfavorable attitudes seen among a sizable percentage of non-medical students are alarming. These results imply that efforts to raise awareness of AMR should focus on a larger group of university students rather than just those in health-related fields.

Practices related to antibiotic use and antimicrobial resistance

There was no statistically significant correlation found between the field of study and antibiotic-related activities, in contrast to knowledge and attitude. This suggests that, contrary to what is frequently found in KAP studies, knowledge and positive attitudes may not always convert into acceptable activities. Research from the Middle East and India has also documented improper behaviors among medical and non-medical students, including self-medication, early antibiotic withdrawal, and the use of leftover medicines. (Jairoun et al., 2019; Gupta et al., 2019).

Implications for public health and education

The results of this study highlight the necessity of all-encompassing, interdisciplinary approaches to combat antibiotic resistance. Non-medical students also make a substantial contribution to antibiotic use patterns, even if medical and paramedical students continue to be a major target group because of their potential roles in healthcare. Programs for raising campus awareness, including AMR ideas into general education classes, and encouraging appropriate healthcare-seeking behavior might all aid in closing current gaps. (Bharti et al., 2020; Precha et al., 2024).

VI. CONCLUSION

The study shows that whereas medical and paramedical students have superior knowledge and attitudes, university students have inadequate understanding and incorrect antibiotic-use habits. In order to combat antimicrobial resistance and encourage sensible antibiotic usage, university-wide educational and behavioral interventions are necessary due to the mismatch between knowledge and practice.

VII. RECOMMENDATIONS

- To raise knowledge of responsible antibiotic use, incorporate antimicrobial resistance education into university curriculum in both medical and non-medical fields.
- Hold frequent awareness campaigns and workshops at colleges to dispel myths, deter self-medication, and encourage responsible healthcare-seeking.
- Increase cooperation with pharmacists and medical professionals to promote the use of prescription antibiotics and encourage student antimicrobial stewardship programs.

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