

**Original Article**

**TO ASSESS THE KNOWLEDGE, ATTITUDE AND PRACTICE OF ANTIBIOTIC USAGE AND RESISTANCE AMONG THE UNDERGRADUATE MEDICAL STUDENTS IN A TERTIARY CARE TEACHING HOSPITAL IN ASSAM: A QUESTIONNAIRE-BASED STUDY**

**DWIPEN KHANIKAR<sup>1\*</sup>, S RENUKA SINGH<sup>2</sup>, MITRA BHATTACHARYYA<sup>3</sup>, PRAN PRATIM SAIKIA<sup>4</sup>, SIDDHARTHA SHANKAR PATOWARY<sup>5</sup>**

<sup>1,4,5</sup>Department of Pharmacology, Gauhati Medical College and Hospital, Guwahati, Assam, India. <sup>2</sup>Department of Pharmacology, Tinsukia Medical College and Hospital, Tinsukia, Assam, India. <sup>3</sup>Department of Pharmacology, Nalbari Medical College and Hospital, Nalbari, Assam, India

\*Corresponding author: Dwipen Khanikar; \*Email: [dwipenkhanikar@gmail.com](mailto:dwipenkhanikar@gmail.com)

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**ABSTRACT**

**Objective:** To study the knowledge, attitude and practice of antibiotic usage and resistance among undergraduate medical students at Gauhati Medical College and Hospital.

**Methods:** It was a questionnaire-based, cross-sectional and observational study. A structured validated questionnaire was used as a study tool consisting of 22 questions. A Google form was then developed and circulated. 3rd Professional Part-I and Part-II MBBS students were included in the study.

**Results:** A total of 268 students participated in the study. Data were analysed using a Microsoft Excel Sheet and Student's t-test. The majority gave correct responses regarding the meaning of antibiotic resistance and agreed that improper use of antibiotics leads to the development of antibiotic resistance. The majority (86.57%) feel that a combination of factors gives rise to antibiotic resistance. Overall, 259 (96.64%) of students think all healthcare providers should have a good knowledge of the rational use of antibiotics and that the use of antibiotics should be guided by culture and sensitivity reports. However, it was seen that only about 33% of students in both groups had attended an educational programme or training on the topic.

**Conclusion:** Most students in both groups have good knowledge and attitudes regarding antibiotic usage and resistance. However, they must attend more educational programs and training to improve practice.

**Keywords:** Antibiotic, Resistance, Knowledge, Attitude, Practice, Undergraduate

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**INTRODUCTION**

Antibiotic resistance is now considered a global public health concern because of its undesirable effects on treatment results, prolongation of morbidity, increase in overall hospital stay, and increase the risk of mortality as well as the medical costs of patients [1]. The problem of irrational prescribing and improper use of antibiotics is related to the increase in the prescribing and the use of antibiotics, which has led to the development of drug-resistant organisms and, thus, the problem of antibiotic resistance [2]. The problem of antibiotic resistance may be related to multiple other factors like self-medication, over-the-counter availability of antibiotics, less strict regulation in the use of antibiotics, costly medical consultations, incentives and pressure provided by pharmaceutical companies for prescribing antibiotics [3]. Various measures have been adopted to stop this growing problem of antibiotic resistance. One such important and effective measure is to improve the awareness of the general population and healthcare professionals about antibiotic resistance [4, 5]. It is essential that healthcare professionals are educated and informed about this problem, who, in turn, can educate the general public [4]. This awareness is also essential so that healthcare professionals can make rational choices in using antimicrobials from the beginning and make people aware of the judicious use of antibiotics [2]. Since undergraduate medical students are the future prescribers of various drugs, including antibiotics, they can be an important group here that can help combat the problem of antibiotic resistance in the future. Assessing the knowledge, attitude, and practice of antibiotic resistance among undergraduate medical students can be helpful in understanding their existing level of awareness regarding this problem and will also guide us in planning required educational interventions if any improvement is needed. This

kind of study regarding antibiotic resistance has never been conducted at Gauhati Medical College earlier. Hence, this study was conducted to assess the knowledge, attitude and practice of antibiotic resistance among undergraduate medical students at Gauhati Medical College and Hospital.

**MATERIALS AND METHODS**

The study was carried out at Gauhati Medical College and Hospital, Guwahati. It was a questionnaire-based, cross-sectional and observational study. A structured validated questionnaire was used as the study tool to assess the knowledge, attitude and practice of antibiotic usage and resistance. The questionnaire was prepared with reference to similar studies done previously [2-8]. The questionnaire consisted of 22 questions (knowledge, 7; attitude, 10; and practice, 5) in total. Before sharing the questionnaire with the participants, a pilot study was conducted. Based on the results found in the pilot study, a few modifications were made, and the final questionnaire was ready. Informed consent was taken. A Google form of the questionnaire was then developed and circulated among the participants. All 3<sup>rd</sup> Professional Part-I and 3<sup>rd</sup> Professional Part-II MBBS students who were willing to participate and give informed consent were included in the study. Informed consent was considered as the willingness to fill up the form. The exclusion criteria were students not willing to participate, not willing to give informed consent, and who were absent from the class. The study was conducted following approval from the Institutional Ethics Committee (IEC approval no. MC/190/2007/Pt-II/Oct.2022/4). Out of 22 questions, five with multiple options were not included in the scoring, and the rest with single options were included in the scoring. Each correct answer and the positive response was given a score of 1, while the wrong response or the negative

response was given a score of 0. The data collected from the filled-up Google forms were entered into Microsoft Excel 2010, and descriptive data such as frequency, percentage, and mean were calculated. To find the statistical difference between the two groups, a Student-t test was done, and  $p < 0.05$  was considered significant. The data were presented as tables.

## RESULTS

A total of 268 students of MBBS 3<sup>rd</sup> Professional participated in the study, of which 103 (38.43%) were of Part I and 165 (61.57%) were of Part II. Most students are in the age group of 21-25 (table 1). The mean age of the participants was  $22.37 \pm 1.10$ .

**Table 1: Professional qualification, gender and Age (n=268)**

Variables	Category	Frequency	Percentage (%)
Professional qualification	Part I	103	38.43
	Part II	165	61.57
Gender	Male	172	64.18
	Female	96	35.82
Age group (in years)	Upto 20	7	2.61
	21-25	259	96.64
	Above 25	2	0.75

**Table 2: Comparison of the knowledge of 3<sup>rd</sup> professional part I and 3<sup>rd</sup> professional part II students**

S. No.	Question	Over all frequency, n (%)	3 <sup>rd</sup> professional Part I frequency, n (%)	3 <sup>rd</sup> Professional part II frequency, n (%)
1	Antibiotic resistance means resistance of bacteria to the effect of antibiotics to which it was sensitive before. (a) Yes (b) No	261(97.39) 7(2.61)	100(97.09) 3(2.91)	161(97.58) 4(2.42)
2	Should antibiotic usage be done for all types of infections when you have a fever? (a) Yes (b) No	24(8.96) 244(91.04)	10(9.71) 93(90.29)	14(8.48) 151(91.52)
3	Does improper use of antibiotics lead to the development of antibiotic resistance? (a) Yes (b) No	259(96.64) 9(3.36)	102(99.03) 1(0.97)	157(95.15) 8(4.85)
4	Is it preferable to use rapidly acting and selective narrow-spectrum antibiotics whenever possible? (a) Yes (b) No	178(66.42) 90(33.58)	69(66.99) 34(33.01)	109(66.06) 56(33.94)
5	What are the causes of antibiotic resistance? A. Not completing the course of antibiotics 249(92.91%) B. Improper and incorrect selection of antibiotics 247(92.16%) C. Improper or inadequate dosing 252(94.03%) D. Substandard drugs 237(88.43%) E. Injudicious prescribing and consumption 259(96.64%) F. All the above 232(86.57%) G. Specify if any other. Specify if any other. Total=5	F-232(86.57%), E-7(2.61%), A+B+C+E-6(2.24%), B+C+E and A-4(1.49%), A+C+E and C+E-3(1.12%) B, B+C+D+E, B+D+E, C, A+B+C+D, A+B+E, A+C, A+E+D and D-1(0.37%) for each.		
	Counterfeiting of drugs		1 0	1
	Frequent prescription of broad-spectrum antibiotics		1 0	1
	Over usage of antibiotics		1 1	0
	Over the counter drugs		1 0	1
	Rapid evolution in bacterial species		1 1	0
6	What can be the consequences of antibiotic resistance according to you? A. Increase in the duration of illness B. Prolongation of hospital stay C. Burden on the patient in terms of health care cost D. All the above E. Specify if any other Specify if any other. Total=5		D-245(91.42%), A-8(2.98%), B-7(2.61%), B+C-3(1.12%), C-2(0.75%), A+C-2(0.75%) A+B-1(0.37%)	
	Decrease availability of drugs (antibiotics) to treat disease		1 0	1
	May lead to burdening of Health Care Infrastructure due to less amount of beds.		1 1	0
	The disease prognosis will become worse		1 1	0
	Treatment problems in the community		1 0	1
	Since antibiotics are limited, hence if it isn't used judiciously, the pathogens often causing not much grave disease can become resistant to most the available antibiotics and there might come a time in the future when humans would succumb to diseases like UTI or RTI due to unavailability of appropriate antibiotics owing to development of resistance among the pathogens.		1 0	1
7	Which of the following terms have you heard of? A. Antibiotic Stewardship Programme B. World Antimicrobial Awareness Week (WHO) C. AWaRe classification of antibiotics (WHO) D. All of the above E. None of the above		A-103(38.43%), D-68(25.37%), E-38(14.18), A+B-32(11.94%), B-12(4.48%), C-6(2.24%), B+C-5(1.87%), A+C-4(1.49%)	

Table 2 shows the knowledge based questions and their responses. It shows that 97.09% of Part I and 97.58% of Part II students responded correctly regarding the meaning of antibiotic resistance. 99.03% of Part I and 95.15% of Part II agreed that improper use of antibiotics leads to the development of antibiotic resistance. Almost 66% of students of both groups prefer to use rapidly acting and

selective narrow-spectrum antibiotics whenever possible. Most overall students (86.57%) feel that not a single but a combination of factors give rise to antibiotic resistance. Regarding familiarity with terms related to antibiotic resistance, only a few students had an idea about these terms, with only 38.43% knowing the Antibiotic Stewardship Programme.

**Table 3: Comparison of attitude of 3<sup>rd</sup> professional part I and 3<sup>rd</sup> professional part II students**

S. No.	Question	Overall frequency, n (%)	3 <sup>rd</sup> professional part I frequency, n (%)	3 <sup>rd</sup> professional part II frequency, n (%)
1	Do you think self-medication with antibiotics can lead to the development of antibiotic resistance? (a) Yes (b) No	259(96.64) 9 (3.36)	102(99.03) 1 (0.97)	157(95.15) 8 (4.85)
2	Do you think antibiotic resistance is a major public health problem and needs to be focused on? (a) Yes (b) No	261(97.39) 7(2.61)	101(98.06) 2 (1.94)	160(96.97) 5 (3.03)
3	Do you think all health care providers should have a good knowledge about the rational use of antibiotics? (a) Yes (b) No	259(96.64) 9 (3.36)	101(98.06) 2 (1.94)	158(95.76) 7 (4.24)
4	Do you think it is necessary to give elaborate knowledge to medical students regarding antibiotic use and various measures to control antibiotic resistance? (a) Yes (b) No	266(99.25) 2(0.75)	102(99.03) 1(0.97)	164(99.39) 1(0.61)
5	Do you think antibiotic use should be stopped once the symptoms are relieved? (a) Yes (b) No	79(29.48) 189(70.52)	34(33.01) 69(66.99)	45(27.27) 120(72.73)
6	What do you think is/are the measures that is needed to control antibiotic resistance? A. To avoid unnecessary and injudicious use of antibiotics B. To obtain local antibiotic resistance pattern and data on a regular basis C. To encourage rational use of antibiotics D. To avoid self-medication and consult concerned doctor whenever necessary E. Specify if you think of any other measure	A+B+C+D-150(55.97%) A-31(11.57%) A+C+D-27(10.07%) D-18(6.72%) C-12(4.48%) A+D-9(3.36%) B-8(2.99%) A+B+D-4(1.49%) A+C-3(1.12%) A+B+C-3(1.12%) C+D-2(0.75%) B+D-1(0.37%)		
	Specify, if you think of any other measure. Total=2			
	To complete the course of antibiotics even if symptoms subsides.	1	1	0
	To generate awareness among the general public.	1	0	1
7	Do you think skipping a few doses of antibiotics will not contribute to the development of antibiotic resistance? (a) Yes (b) No	83(30.97) 185(69.03)	31(30.10) 72(69.90)	52(31.52) 113(68.48)
8	Do you think the irrational use of antibiotics in animals is also an important cause of the development of antibiotic resistance? (a) Yes (b) No	237(88.43) 31(11.57)	91(88.35) 12(11.65)	146(88.48) 19(11.52)
9	Do you think antibiotics can be taken prophylactically for some diseases? (a) Yes (b) No	198(73.88) 70(26.12)	76(73.79) 27(26.21)	122(73.94) 43(26.06)
10	Do you think the usage of antibiotics should be guided by culture and sensitivity report? (a) Yes (b) No	259(96.64) 9(3.36)	98(95.15) 5(4.85)	161(97.58) 4(2.42)

Table 3 shows Attitude-based questions and their responses. It shows that most students (98.06% of Part I and 96.97% of Part II) think antibiotic resistance is a major public health problem and needs to be focused on. Overall, 259 (96.64%) of students believe that all healthcare providers should have good knowledge about the rational use of antibiotics, and usage of antibiotics should be guided

by culture and sensitivity reports. When asked about the measures needed to control antibiotic resistance, a majority feel that combinations of measures are to be implemented. Overall, 237(88.43%) of students agreed that the irrational use of antibiotics in animals is also an important cause of the development of antibiotic resistance.

**Table 4: Comparison of the practice of 3<sup>rd</sup> professional part I and 3<sup>rd</sup> professional part II students**

S. No.	Question	Over all frequency, n (%)	3 <sup>rd</sup> professional part I frequency, n (%)	3 <sup>rd</sup> professional part II frequency, n (%)
1	Do you practice self-medication of antibiotics? (a) Yes (b) No	69(25.75) 199(74.25)	28(27.18) 75(72.82)	41(24.85) 124(75.15)
2	Do you always complete the full course of antibiotic therapy whenever prescribed by the physician? (a) Yes (b) No	244(91.04) 24(8.96)	91(88.35) 12(11.65)	153(92.73) 12(7.27)
3	Have you ever attended any educational programme or training about the rational use of antibiotics? (a) Yes (b) No	87(32.46) 181(67.54)	34(33.01) 69(66.99)	53(32.12) 112(67.88)
4	What are the sources you use to gather information about antibiotic usage and resistance? A. Newspapers B. Media/Internet C. Books/journals/magazines D. CME/other educational programs E. Specify, if any other	C-54(20.15%) B+C-48(17.91%) A+B+C+D-43(16.04%) B-33 (12.31%) B+C+D-29(10.82%) C+D-19(7.09%) D-19 (7.09%) A+B+C-10(3.73%) B+D-7(2.61%) A+C+D-2(0.75%) A+B+D-2(0.75%) A+B-2(0.75%)		
5	Do you always check the expiry date of the antibiotics before using it? (a) Yes (b) No	260(97.01) 8(2.99)	102(99.03) 1(0.97)	158(95.76) 7(4.24)

Table 4 shows the practice-related questions and their responses. It shows that most students (88.35% of Part I and 92.73% of Part II) always complete the full course of antibiotic therapy. Most students use a combination of sources to gather information about antibiotic usage and resistance. However, it was seen that only about 33% of

students of both groups had attended an educational programme or training about the rational use of antibiotics. The mean KAP score was calculated as shown in table 5. The difference between the mean scores was analyzed using Student's t-test, but no statistical significance was found.

**Table 5: Mean knowledge, attitude, and practice score of the participants (n =268)**

Professional qualification	Mean±SD score		
	Knowledge	Attitude	Practice
Phase 3 Part I	3.53±0.57	7.49±0.90	2.93±0.70
Phase 3 Part II	3.50±0.63	7.52±0.97	2.96±0.69
P	0.68	0.76	0.77

## DISCUSSION

This study gives us good information regarding the knowledge, attitude, and practice of undergraduate students regarding antimicrobial usage and resistance. The key to imparting and motivating undergraduate students about antibiotic resistance should start at the grassroots level. In the undergraduate course, the knowledge about antibiotics and antibiotic resistance starts from MBBS 2nd professional; hence, it is a good time to evaluate whether they gain adequate knowledge about the topic, which will further help them in adopting a good attitude and practice about the same in their future professional life. 261(97.39) of students in our study think antibiotic resistance is a major public health problem that needs to be focused on, which is similar to a study done by Mahajan *et al.*, where 83(96.51%) students of second-year MBBS responded positively [9]. In this study, the majority of the students (96.64%) agree that improper use of antibiotics leads to the development of antibiotic resistance and 96.64 % of students think that self-medication with antibiotics can lead to the development of antibiotic resistance. This is similar to the study done by Panthi S *et al.*, where 76.3% of students strongly agreed and 21.3 % agreed that improper use of antibiotics can cause antibiotic resistance and, 30 % of students strongly agreed and 54.9 % agreed that self-prescription promotes antibiotic resistance [10]. About 87% of students feel that

a combination of multiple factors causes antibiotic resistance. However, in the study by Yashin NA *et al.*, only about 65% felt that antibiotic resistance is caused by various factors [5]. 74.25% of students do not practise self-medication of antibiotics, and 91.04% of students always complete the entire course of antibiotic therapy whenever prescribed by the physician, which is more than the study done by Dutta H K *et al.*, where 23.64% of students never self-medicated with antibiotics and 71.05% of students always complete the full course of treatment [3]. In our research, 87(32.46) of students attended educational programmes or training about the rational use of antibiotics, which is higher than the study done by Panthi S *et al.*, where 17 (6.7) students attended a CME about the rational use of antibiotics [10].

## LIMITATIONS OF THE STUDY

It is based on a convenience sample involving only two batches of 3rd professional part I and 3rd professional part II medical students from one medical college. So, the main limitation of this study is that the data provided is of local interest to a medical college.

## CONCLUSION

Most students in both groups have good knowledge and attitudes regarding antibiotic usage and resistance. However, they must

attend more educational programs and training to improve practice. They should be updated regularly on the changing prevalence of microorganisms, antibiotic resistance patterns, and the development of new antibiotics, as well as updated guidelines on antibiotic use. Regular updates ensure that clinicians prescribe the most cost-effective antibiotic, which improves patient care and combats the global problem of antibiotic resistance.

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#### AUTHORS CONTRIBUTIONS

Conception/design: Dr Dwipen Khanikar, Dr S Renuka Singh, Dr Mitra Bhattacharyya, Dr Pran Pratim Saikia, Dr Siddhartha Shankar Patowary Provision of study material: Dr Dwipen Khanikar, Dr S Renuka Singh, Dr Mitra Bhattacharyya, Dr Pran Pratim Saikia, Dr Siddhartha Shankar Patowary Collection of data: Dr Dwipen Khanikar, Dr S Renuka Singh, Dr Mitra Bhattacharyya, Dr Pran Pratim Saikia, Dr Siddhartha Shankar Patowary Data analysis and interpretation: Dr Dwipen Khanikar, Dr S Renuka Singh, Dr Mitra Bhattacharyya, Dr Pran Pratim Saikia, Dr Siddhartha Shankar Patowary Manuscript writing: Dr Dwipen Khanikar, Dr S Renuka Singh, Dr Mitra Bhattacharyya, Dr Pran Pratim Saikia, Dr Siddhartha Shankar Patowary Final approval of manuscript: Dr Dwipen Khanikar, Dr S Renuka Singh, Dr Mitra Bhattacharyya, Dr Pran Pratim Saikia, Dr Siddhartha Shankar Patowary

#### CONFLICT OF INTERESTS

Declared none

#### REFERENCES

1. Abera B, Kibret M, Mulu W. Knowledge and beliefs on antimicrobial resistance among physicians and nurses in hospitals in Amhara region Ethiopia. *BMC Pharmacol Toxicol.* 2014;15(26):26. doi: [10.1186/2050-6511-15-26](https://doi.org/10.1186/2050-6511-15-26), PMID [24887310](https://pubmed.ncbi.nlm.nih.gov/24887310/).
2. Gupta R, Malhotra A, Malhotra P. Comparative assessment of antibiotic resistance among first and second year undergraduate medical students in a Tertiary Care Teaching Hospital. *Int J Res Med Sci.* 2019 Feb;7(2):481-5. doi: [10.18203/2320-6012.ijrms20190358](https://doi.org/10.18203/2320-6012.ijrms20190358).
3. Dutt HK, Sarkhil MZ, MA, Singh G. A comparative knowledge attitude and practice study of antimicrobial use self-medication and antimicrobial resistance among final year students of MBBS BDS and BSc nursing at a Tertiary Care Hospital at Kannur. *Natl J Physiol Pharm Pharmacol.* 2018 Jun 22;8(9):1305-11. doi: [10.5455/njppp.2018.8.0518130052018](https://doi.org/10.5455/njppp.2018.8.0518130052018).
4. Bharath Kumar VD, Kalpana L. A comparative study to assess the awareness of antibiotic resistance amongst first and second year medical undergraduate students in a medical college. *Int J Basic Clin Pharmacol.* 2018 Aug;7(8):1567-71. doi: [10.18203/2319-2003.ijbcp20183025](https://doi.org/10.18203/2319-2003.ijbcp20183025).
5. Yashin AN, Thakuria N, Narzary H, Satnami D, Paul N. A questionnaire-based survey on the knowledge attitude and practices about antimicrobial resistance and usage among the MBBS students and doctors of a Tertiary Care Teaching Hospital in Silchar Assam India. *Int J Basic Clin Pharmacol.* 2018 Jul;7(8):1630-6. doi: [10.18203/2319-2003.ijbcp20183035](https://doi.org/10.18203/2319-2003.ijbcp20183035).
6. Shaik T, Meher BR. A questionnaire-based study to assess the knowledge attitude and practice (KAP) of rationale use of antibiotics among undergraduate dental students in a Tertiary Care Dental Hospital of South India. *Int J Basic Clin Pharmacol.* 2017 Jan;6(2):312-5. doi: [10.18203/2319-2003.ijbcp20170321](https://doi.org/10.18203/2319-2003.ijbcp20170321).
7. Akbar Z, Alquwez N, Alsolais A, Thazha SK, Ahmad MD, Cruz JP. Knowledge about antibiotics and antibiotic resistance among health related students in a Saudi University. *J Infect Dev Ctries.* 2021 Jul 31;15(7):925-33. doi: [10.3855/jidc.12329](https://doi.org/10.3855/jidc.12329), PMID [34343117](https://pubmed.ncbi.nlm.nih.gov/34343117/).
8. Sannathimmappa MB, Nambiar V, Aravindakshan R. A cross-sectional study to evaluate the knowledge and attitude of medical students concerning antibiotic usage and antimicrobial resistance. *Int J Acad Med.* 2021 Jun 29;7(2):113-9. doi: [10.4103/IJAM.IJAM\\_57\\_20](https://doi.org/10.4103/IJAM.IJAM_57_20).
9. Mahajan M, Dudhgaonkar S, Deshmukh S. A questionnaire based survey on the knowledge attitude and practices about antimicrobial resistance and usage among the second year MBBS students of a teaching Tertiary Care Hospital in Central India. *Int J Pharmacol Res.* 2014 Dec;4(4):175-9. doi: [10.7439/ijpr.v4i4.120](https://doi.org/10.7439/ijpr.v4i4.120).
10. Panthi S, Pathak P, Sitaula J. Knowledge attitude and practice on antibiotic use and its resistance among medical students in a Tertiary Care Hospital. *JCMC.* 2020 Dec 16;10(4):16-9. doi: [10.54530/jcmc.268](https://doi.org/10.54530/jcmc.268).