

## Knowledge, attitude and practice of self-medication with antibiotics among first-year and third-year medical students: a questionnaire-based study

Supriya D. Khade\*, Mohini Mahatme, Neha Meshram, Kavita Jaiswal,  
Divya Dhaked, Sachin Hiware

Department of Pharmacology, Government Medical College, Nagpur, Maharashtra, India

**Received:** 16 March 2026

**Revised:** 12 April 2026

**Accepted:** 13 April 2026

**\*Correspondence:**

Dr. Supriya D. Khade,

Email: [khadesupriya96@gmail.com](mailto:khadesupriya96@gmail.com)

**Copyright:** © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

### ABSTRACT

**Background:** Self-medication (SM) involves using medicines without consulting a doctor, which can lead to wrong diagnosis, harmful interactions and delays in proper treatment. The market value of self-medication was estimated to be USD 87.5 billion in 2022 and is projected to reach USD 200.5 billion by 2032. Antibiotic resistance has emerged as a critical global concern in today's world. One of the causes of antibiotic resistance is self-medication. This study assesses knowledge, attitude, and practice of antibiotic self-medication among first and third-year medical students.

**Methods:** This study was a cross-sectional, survey-based study conducted to assess the knowledge, attitude and practice of self-medication with antibiotics among first-year and third-year medical students at a tertiary care teaching hospital in India. The data for this study were collected through a self-designed, semi-structured, pre-validated questionnaire circulated through Google Forms to medical students.

**Results:** A majority of students from both academic years demonstrated awareness that antibiotics are organism-specific. However, the understanding of the ineffectiveness of antibiotics against viral infections was higher among third-year students than among first-year students. Students in both first-year and third-year groups identified textbooks as the primary source of information about antibiotics.

**Conclusions:** This study highlights a significant gap between the knowledge and practical application of antibiotic use among first-year and third-year medical students. To address this, targeted educational interventions are essential, including formal training, workshops and the establishment of specific courses on antibiotic use.

**Keywords:** Antibiotics, Antimicrobial resistance, KAP study, Medical students, Self-medication

### INTRODUCTION

Self-medication (SM) involves using medicines without consulting a doctor, which can lead to wrong diagnosis, harmful interactions and delays in proper treatment.<sup>1,2</sup> The market value of self-medication was estimated to be USD 87.5 billion in 2022 and is projected to reach USD 200.5 billion by 2032. According to estimates, the market for self-administered medications makes up over 8.6% of the global pharmaceutical business during the forecast period 2022-2032.<sup>3</sup>

Antibiotics are medications used to treat bacterial infections.<sup>4</sup> These lifesaving drugs work by either eliminating bacteria or inhibiting their growth. However, antibiotic resistance (ABR), characterized by the reduced effectiveness of antibiotics against certain bacteria, has emerged as a critical global concern.<sup>5</sup> Self-medication with antibiotics, therefore, has the potential to harm both individual patients and society at large. Inappropriate usage, insufficient dosages, and noncompliance with prescription guidelines are the primary drivers of resistance. Self-medication with antibiotics exacerbates

the problem.<sup>6,7</sup> Approximately 50% of antibiotics are purchased without a prescription and used over-the-counter worldwide, particularly in low-to-middle-income countries where the implementation of laws regarding prescription medication sales is not as strict.<sup>8,9</sup> A recent study from central India reported a prevalence of about 60% self-medication habits across the urban community population.<sup>10</sup>

The rationality, indications and adverse effects of drugs are taught in medical schools. Medical students are the future prescribers and healthcare leaders, responsible not only for prescribing antibiotics rationally but also for communicating with patients about their appropriate use. Hence, medical students are a particularly important group to access the knowledge, practice and attitude for the antibiotic use. This study includes first and third-year medical students to evaluate differences in awareness and behaviour between these two groups as first-year medical students have limited theoretical and clinical exposure and have not undergone any formal pharmacology training where indications, rationality of antibiotics are taught. Moreover, there has been no substantial study on the antibiotic self-medication behaviours of first and third-year medical students in India.

Hence, this study was planned with the aim and objective to assess the knowledge, attitude and practice of self-medication with antibiotics among first-year and third-year medical students.

The findings from this study will help provide insight into the impact of medical education on self-medication and antibiotic use patterns in medical students. Also, this study will guide the development of targeted training curriculum in universities and inform policy interventions aimed at improving appropriate antibiotic use, leading to behavioural change and ultimately decreasing drug resistance.

## METHODS

This study was an observational, cross-sectional, questionnaire-based study conducted to assess the knowledge, attitude and practices (KAP) regarding self-medication with antibiotics among medical students. The study was carried out at a tertiary care teaching hospital, Government Medical College, Nagpur, in central India.

The study was conducted after obtaining approval from the Institutional Ethics Committee (Approval No: 3552).

The study was conducted for a duration of two months, from August 2024 to October 2024. Medical undergraduate students currently enrolled in the first-year and third-year of MBBS were included in the study. Students who did not provide informed consent or were unwilling to participate were excluded. All participants were informed about the purpose and nature of the study.

Electronic informed consent was obtained before data collection.

A total of 200 students were selected from both first- and third-year medical students. Data was collected using a self-designed, semi-structured questionnaire created in Google Forms. The questionnaire was reviewed and validated by the subject experts before circulation. It contained both open-ended and close-ended questions. The questionnaire consisted of questions pertaining to knowledge, attitude and practice of self-medication with antibiotics in medical students.

The collected data and the results were presented using descriptive statistics.

## RESULTS

Among the 200 students invited to participate, 189 (95.0%) responded to the questionnaire, including 102 first-year and 87 third-year MBBS students. The participants were aged between 17 and 23 years.

The most commonly known antibiotics among first-year students were penicillin, streptomycin, amoxicillin, and azithromycin. In addition to these, third-year students identified ceftriaxone and amikacin more frequently.

Regarding indications for self-medication with antibiotics, 49 (48.5%) first-year and 29 (33.7%) third-year students reported common cold and fever as the primary indication. Bacterial infections were identified by 14 (13.6%) first-year and 8 (9.0%) third-year students, while pharyngitis was reported by 8 (8.2%) first-year and 18 (20.2%) third-year students.

When asked whether antibiotics are disease-specific or organism-specific, 55 (54.2%) first-year and 61 (70.6%) third-year students correctly identified antibiotics as organism-specific. However, several first-year students expressed uncertainty regarding their appropriate use.

Regarding the role of antibiotics in viral infections, 56 (54.9%) first-year and 20 (22.9%) third-year students believed that antibiotics are effective against them.

With respect to the duration of self-medication, 68 (66.7%) first-year and 52 (59.8%) third-year students considered 1–3 days acceptable. A duration of 3–5 days was reported by 35 (34.3%) first-year and 18 (20.7%) third-year students. Additionally, 10 (9.8%) first-year students reported using antibiotics for 5–7 days without consultation.

Gastrointestinal adverse effects such as diarrhoea, nausea, and vomiting were identified by 36 (35.0%) first-year and 32 (37.0%) third-year students. Allergic reactions were reported by 31 (30.0%) first-year and 26 (29.9%) third-year students. Antibiotic resistance as a potential adverse outcome was recognised by 5 (5.0%) first-year and 7 (8.0%) third-year students (Figure 1).

Concerning the potential risks and dangers of self-medication with antibiotics in terms of drug interactions, liver toxicity was cited by 37 (36.3%) first-year students and 29 (33.3%) third-year students. Other concerns among first-year and third-year students included stomach upset [27 (26.5%) versus 19 (21.8%)], rash [22 (21.6%) versus 16 (18.4%)], and fever [27 (26.5%) versus 6 (6.9%)], respectively.

31 (35.6%) third-year and 16 (15.6%) first-year students demonstrated knowledge about the contraindications of antibiotic self-medication, including drug interactions, renal or hepatic impairment, and allergic conditions.

Textbooks were reported as the primary source of knowledge by 68 (66.7%) first-year and 64 (73.6%) third-year students. Google/internet was cited by 57 (55.9%) first-year and 9 (10.3%) third-year students (Figure 2).

A high proportion of students, 93 (91.0%) first-year and 79 (91.0%) third-year students, acknowledged that self-medication contributes to antibiotic misuse.

The potential consequences of prolonged antibiotic use, such as antibiotic resistance, superinfections, and organ toxicity, were recognised by 55 (54.2%) first-year and 47 (54.2%) third-year students.

Self-medication was considered “sometimes justified” by 62 (60.8%) first-year and 43 (49.4%) third-year students. It was considered “rarely justified” by 28 (27.5%) first-year and 17 (19.5%) third-year students, while the remaining participants believed it was never justified.

In assessing whether further training apart from the existing curriculum could impact the pattern and perspective of self-medication with antibiotics, 53 (52%) first-year and 39 (44.8%) third-year students asserted a positive response. A small proportion, 9 (8.6%) first-year

and 2 (2.3%) third-year students, believed it would have no impact.

The practice of antibiotic self-medication was common and comparable between both groups (Table 1). The most frequently used antibiotics were amoxicillin-clavulanic acid, amoxicillin, azithromycin, and ceftriaxone.

Approximately 15 students (14.7%) from first-year and 13 students (14.9%) from third-year reported that they never self-medicate with antibiotics.

Prophylactic antibiotic use at the onset of symptoms was reported as “sometimes” by 50 (49.0%) first-year and 27 (31.0%) third-year students, and “rarely” by 38 (37.3%) first-year and 21 (24.0%) third-year students. In contrast, 10 (9.8%) first-year and 19 (21.8%) third-year students reported never using antibiotics prophylactically without consultation.

Nearly all respondents reported checking the expiry date before antibiotic use. Specifically, 99 (97.0%) first-year and 84 (96.6%) third-year students reported checking expiry dates. Additionally, over 85% of students in both years reviewed dosage instructions and necessary precautions before self-administration.

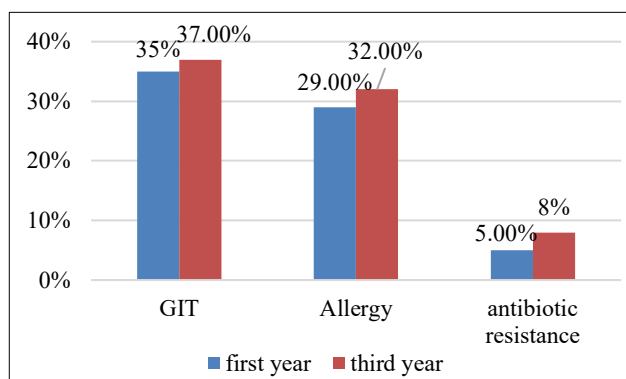
The majority of students in both groups preferred not to reuse previously prescribed antibiotics for themselves or their relatives, regardless of the condition.

87 (85.0%) first-year and 74 (85.0%) third-year students reported actively learning about dosage, indications, spectrum of activity, adverse effects, precautions, and drug interactions before using antibiotics.

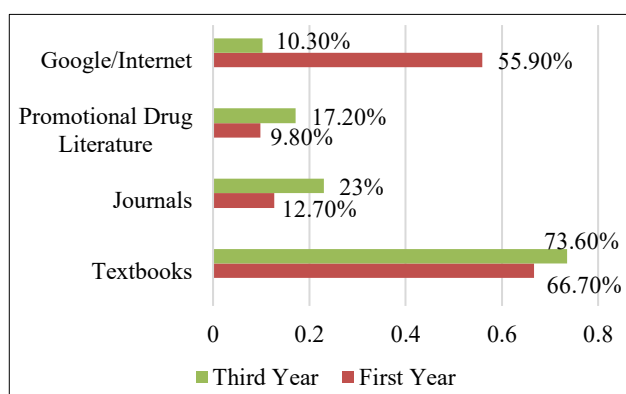
Awareness of government programs promoting rational antibiotic use was low, with only 10 (9.8%) first-year and 9 (10.3%) third-year students reporting awareness, while the majority lacked knowledge of such initiatives.

**Table 1: Practice of participants towards self-medication with antibiotics (n=189).**

Questions	First-year		Third year	
	Yes (% , N)	No (% , N)	Yes (% , N)	No (% , N)
<b>Have you ever self-medicated with antibiotics?</b>	60.8 (62)	39.2 (40)	45.9 (40)	54.0 (47)
<b>Do you know about any government initiative to promote the rational use of antibiotics?</b>	11.7 (12)	88.2 (90)	9.1 (8)	74.7 (65)
<b>Do you check the expiry date of the antibiotic before using it?</b>	97.1 (99)	2.9 (3)	97.7 (85)	2.3 (2)
<b>Do you prefer taking the same antibiotics first that you have used earlier, irrespective of the condition or symptom you or your near dear ones are experiencing?</b>	41.1 (42)	58.8 (60)	39.1 (34)	60.9 (53)
<b>Do you try to read about the dose, dosing schedule, indication, spectrum of organisms, adverse events, precautions and drug interactions about the antibiotic/s</b>	87.2 (89)	12.7 (13)	88.5 (77)	11.5 (10)



**Figure 1: Awareness of side effects associated with antibiotic use among first-year and third-year medical students.**



**Figure 2: Sources of knowledge regarding antibiotics among first-year and third-year medical students.**

## DISCUSSION

This study explored and compared the knowledge, attitude, and practices related to self-medication with antibiotics among first- and third-year MBBS medical students at a tertiary care teaching hospital. Out of 200 invited students, 189 participated, i.e., 102 first-year and 87 third-year students.

Antibiotic awareness was higher among third-year students, who more frequently identified broad-spectrum and advanced antibiotics such as ceftriaxone and amikacin, compared to first-year students, who mostly named commonly used antibiotics like penicillin, streptomycin, and amoxicillin. This higher awareness among third-year students may be attributed to their exposure to formal pharmacology training compared to first-year students. Similar results were observed in the study by Tshokey et al, where 78% of medical students were aware of commonly used antibiotics such as amoxicillin and penicillin.<sup>11</sup>

More than half, 56 (55%) first-year students and 20 (23%) third-year students, believed that antibiotics are useful for treating viral infections. This may reflect inadequate behavioural training and persistent misconceptions

regarding antibiotic use. A common misconception that antibiotics are “universal healers” may contribute to this belief. Similar findings were reported by Gupta et al, who emphasized that academic instruction alone does not fully prevent inappropriate beliefs about antibiotic use for viral illnesses.<sup>12</sup>

Both 55 (54%) first-year and 61 (70.1%) third-year students correctly recognised that antibiotics are organism-specific. However, 47 (46%) of first-year and 26 (29.1%) of third-year students still believed that antibiotics are not organism-specific, indicating incomplete conceptual understanding. Similar deficiencies were documented by Sobierajski et al, who recommended strengthening clinical antibiotic education to bridge such gaps.<sup>13</sup>

A considerable proportion of students perceived that antibiotics could be self-administered for short periods (1–3 days) without consultation—68 (66.7%) of first-year and 52 (59.8%) of third-year students—indicating a persistent knowledge gap. Similar patterns of premature discontinuation and inappropriate antibiotic use were reported by Haque et al.<sup>14</sup>

Gastrointestinal symptoms were the most frequently reported adverse effects by 37 (35%) first-year and 32 (37%) third-year students, followed by allergic reactions 21% by both groups. Similar findings were reported by Gupta et al, who noted that although knowledge of antibiotic use was generally satisfactory, awareness of long-term consequences such as antibiotic resistance remained limited.<sup>15</sup>

Knowledge of contraindications was limited, with only 16 (15.6%) first-year and 31 (35.6%) third-year students being aware of underlying health conditions affecting antibiotic safety. Comparable deficits were reported by Bonna et al.<sup>16</sup>

Textbooks were identified as the primary source of antibiotic knowledge by 68 (66.7%) first-year and 64 (73.6%) third-year students, while online sources such as Google were more frequently used by first-year students. Similar trends were reported by Shitindi et al.<sup>17</sup>

A strong positive attitude toward rational antibiotic use was observed, with 91% of participants from both groups acknowledging that self-medication contributes to antibiotic misuse. However, this awareness did not translate into responsible behaviour, as 62 (60.8%) first-year and 43 (49.4%) third-year students believed that self-medication was sometimes justified. This phenomenon, often described as the “knowledge–practice gap,” has also been reported by Hu et al.<sup>18</sup>

Encouragingly, 53 (52%) first-year and 39 (44.8%) third-year students agreed that additional training beyond the existing curriculum could improve self-medication practices. Similar attitudes have been observed by Efthymiou et al, where medical students expressed a

strong desire for enhanced antimicrobial stewardship education.<sup>19</sup>

Approximately 60% of students in both groups reported practising self-medication with antibiotics. Commonly self-medicated antibiotics included amoxicillin, amoxiclav, azithromycin, and ceftriaxone, which are widely available and perceived as safe and broad-spectrum.

Prophylactic antibiotic use was reported by 50 (49%) first-year and 27 (31%) third-year students. Similar misuse patterns were observed by Hu et al, who found that 30–40% of students reported prophylactic use during early symptoms of infection.<sup>18</sup>

Awareness of government or institutional initiatives promoting rational antibiotic use was extremely low, with only about 10% of participants from both first-year and third-year groups reporting awareness. Similar findings were reported by Al Taani et al, where only 14% of participants were familiar with national guidelines.<sup>20</sup>

Overall, while clinical exposure in later years improved certain aspects of antibiotic knowledge, inappropriate self-medication and misconceptions remained prevalent. Although students demonstrated baseline knowledge and cautious attitudes, significant gaps persisted in the application of knowledge, awareness of contraindications, stewardship initiatives, and differentiation between viral and bacterial infections.

This diminishing yet persistent gap from preclinical to clinical years highlights the need for a revised, case-based, and practically oriented curriculum focused on rational antibiotic use and resistance.

As this study was conducted at a single institution, the findings may not be generalizable to all medical colleges in India. Additionally, only first- and third-year students were included, excluding other academic years. The cross-sectional design captures responses at a single point in time, limiting assessment of longitudinal changes in knowledge or behaviour.

## CONCLUSION

The study highlights the comparison between the knowledge, attitude and practice of self-medication in first and third-year medical students. The third-year medical students demonstrated greater knowledge due to the better understanding, conceptualisation, and application of pharmacology, which is taught in the second year of medical schools. Although third-year students showed a slightly better understanding of self-medication and antibiotic specificity, adverse effects and potential risks, a stronger educational intervention is needed to have formal training on antibiotic usage for robust antibiotic use to prevent antibiotic resistance.

## ACKNOWLEDGEMENTS

The authors express sincere gratitude to the first-year and third-year medical students who took an active part in the research. They would especially like to thank the Dean, the Head of Department of Pharmacology, for their professional insights, and the other faculty members of the Department of Pharmacology for their assistance.

*Funding: No funding sources*

*Conflict of interest: None declared*

*Ethical approval: The study was approved by the Institutional Ethics Committee*

## REFERENCES

1. Bennadi D. Self-medication: A current challenge. *J Basic Clin Pharm* 2013;5:19-23.
2. Chaudhary PK, Maurya AK, Jain A, Sharma N, Mishra A. Self-medication practices with antibiotics among health care professionals in Uttar Pradesh, India: A questionnaire-based study. *Indo Am J Pharm Res.* 2015;5:752-9.
3. Fact MR. Self-Administered Medication Market. Available at: <https://www.factmr.com/report/328/self-administered-medication-market>. Accessed on 15 January 2026.
4. Zajmi D, Berisha M, Begolli I, Hoxha R, Mehmeti R, Mulliqi-Osmani G, et al. Public knowledge, attitudes and practices regarding antibiotic use in Kosovo. *Pharm Pract (Granada).* 2017;15(1):827.
5. Antwi AN, Stewart A, Crosbie M. Fighting antibiotic resistance: a narrative review of public knowledge, attitudes, and perceptions of antibiotics use. Volume 140. *Perspectives in Public Health.* SAGE Publications Ltd. 2020;338-50.
6. Chapot L, Sarker MS, Begum R, Hossain D, Akter R, Hasan MM, et al. Knowledge, attitudes and practices regarding antibiotic use and resistance among veterinary students in Bangladesh. *Antibiotics.* 2021;10(3):10030332.
7. Okeke IN, Laxminarayan R, Bhutta ZA, Duse AG, Jenkins P, O'Brien TF, et al. Antimicrobial resistance in developing countries. Part I: Recent trends and current status. Volume 5. *Lancet Infect Dis.* 2005;481-93.
8. Alhomoud F, Aljamea Z, Almahasnah R, Alkhalifah K, Basalelah L, Alhomoud FK. Self-medication and self-prescription with antibiotics in the Middle East-do they really happen? A systematic review of the prevalence, possible reasons, and outcomes. *Int J Infect Dis.* 2017;57:3-12.
9. Nair A, Doibale MK, Kulkarni SK, Dimple VK, Rajput PS, Shingare AD. Pattern of self-medication with antibiotics among undergraduate medical students of a Government Medical College. *Int J Prevent Public Health Sci.* 2015;1:9-13.
10. Rathod P, Sharma S, Ukey U, Sonpimpale B, Ughade S, Narlawar U, et al. Prevalence, Pattern, and Reasons for Self-Medication: A Community-Based Cross-

- Sectional Study from Central India. *Cureus.* 2023;33917.
11. Tshokey T, Adhikari D, Tshering T, Wangmo S, Wangdi K. Assessing the Knowledge, Attitudes, and Practices on Antibiotics Among the General Public Attending the Outpatient Pharmacy Units of Hospitals in Bhutan: A Cross-Sectional Survey. *Asia Pac J Public Health.* 2017;29(7):580-8.
  12. Gupta RK, Singh P, Rani R, Kumari R, Langer B, Gupta R. Antibiotic use: evaluating knowledge, attitude and practices among medical students in a sub-Himalayan state. *Int J Basic Clin Pharmacol.* 2017;6(10):2516-21.
  13. Sobierajski T, Mazińska B, Wanke-Rytt M, Hryniewicz W. Knowledge-based attitudes of medical students in antibiotic therapy and antibiotic resistance: a cross-sectional study. *Int J Environ Res Public Health.* 2021;18(8):3930.
  14. Haque M, Rahman NA, McKimm J, Kibria JM, Majumder MA, Haque HZ, et al. Antibiotic self-medication practices among Malaysian university students. *Int J Environ Res Public Health.* 2019;16(12):2165.
  15. Gupta MK, Vohra C, Raghav P. Assessment of knowledge, attitudes, and practices about antibiotic resistance among medical students in India. *J Fam Med Prim Care.* 2019;8(9):2864-9.
  16. Bonna AS, Mazumder S, Manna RM, Pavel SR, Nahin S, Ahmad I, et al. Knowledge, attitudes and practices regarding antibiotic use among medical students in Bangladesh. *Health Sci Rep.* 2024;7(1):e700.
  17. Shitindi L, Issa O, Poyongo BP, Horumpende PG, Kagashe GA, Sangeda RZ. Comparison of knowledge, attitude, practice and predictors of self-medication with antibiotics among medical and non-medical students in Tanzania. *Front Pharmacol.* 2024;14:1301561.
  18. Hu Y, Wang X, Tucker JD, Little P, Moore M, Fukuda K, et al. Knowledge, Attitude, and Practice with Respect to Antibiotic Use among Chinese Medical Students: A Multicentre Cross-Sectional Study. *Int J Environ Res Public Health.* 2018;15(6):1165.
  19. Efthymiou P, Gkentzi D, Dimitriou G. Knowledge, Attitudes and Perceptions of Medical Students on Antimicrobial Stewardship. *Antibiotics (Basel).* 2020;9(11):821.
  20. Al-Taani GM, Karasneh RA, Al-Azzam S, Bin Shaman M, Jirjees F, Al-Obaidi H, et al. Knowledge, Attitude, and Behavior about Antimicrobial Use and Resistance among Medical, Nursing and Pharmacy Students in Jordan: A Cross-Sectional Study. *Antibiotics (Basel).* 2022;11(11):1559.

**Cite this article as:** Khade SD, Mahatme M, Meshram N, Jaiswal K, Dhaked D, Hiware S. Knowledge, attitude and practice of self-medication with antibiotics among first-year and third-year medical students: a questionnaire-based study. *Int J Basic Clin Pharmacol* 2026;15:526-31.