ORIGINAL RESEARCH ARTICLE

Comparative Analysis of Self-Medication Practices with Antibiotics Among Non-Medical and Medical College Students in India

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DOI: 10.55489/njcm.151120244417

ABSTRACT

Background: Self-medication is prevalent globally, making the processes easier but raising potential hazards like antibiotic resistance. College students, influenced by social media, exhibit alarming self-medication behaviours. This cross-sectional study surveyed undergraduate students across medical, nursing, and non-health science institutions to assess the self-medication habits, knowledge and attitude of students.

Methods: This descriptive cross-sectional study was conducted across various educational institutions from August 2023 to February 2024, targeting undergraduate students aged 18 and over. Using a pre-validated questionnaire, data on socio-demography, self-medication with antibiotics, and related knowledge were collected via Google Forms. The sample size was doubled to 1175 for better statistical power. Data analysis was performed using standard statistical tools.

Results: Analysis of data demonstrated that a substantive proportion of students self-medicate with antibiotics. For medical students, convenience was the biggest issue and for non-medical students, it was cost-saving coupled with distrust in doctors. The most common complaint received for self-medication was throat pain. Medical students used textbooks for necessary information whereas non-medical students went to local shops for advice. Patterns differed somewhat in comparison with international studies, indicating regional differences. Strikingly, medical students predominantly relied on academic knowledge and previous experiences while using antibiotics, whereas non-medical students often obtained antibiotics from shops or the internet, making them vulnerable to misdiagnosis and inappropriate treatment.

Conclusion: This highlights the importance of implementing specific interventions to reduce unsafe self-medication practices in students.

Keywords: Self Medication, Antibiotics, Undergraduate Students, Medical Education, Non-medical Education, Medical students, Non-Medical Students

ARTICLE INFO

Financial Support: None declared
Conflict of Interest: None declared
Received: 30-06-2024, **Accepted**: 17-10-2024, **Published**: 01-11-2024
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How to cite this article: Dhingra M, Kaur M, Gupta VK, Sagar B, Singla N, Singh S, Ghosh A. Comparative Analysis of Self-Medication Practices with Antibiotics Among Non-Medical and Medical College Students in India. Natl J Community Med 2024;15(11):970-979. DOI: 10.55489/njcm.151120244417

www.njcmindia.com | pISSN: 0976-3325 | eISSN: 2229-6816 | Published by Medsci Publications

INTRODUCTION

The practice of self-care is appreciated worldwide, as it allows patients to take responsibility and build confidence in their ability to manage their health.[1] However, this self-care habit causes an increase in uncontrolled self-medication practices, which are now being looked at as a part of self-care.[2] Self-medication can be seen as the act, for an individual, of consuming a drug, on his/her initiative, without consulting a doctor for the case in hand, whether the drug is already in his/her possession or whether he/she has obtained it for that purpose (at a pharmacist's or from another person).[3]

It has been seen that Self-medication with over-the-counter (OTC) medicines is becoming an increasingly popular practice around the world. The global prevalence rate of self-medication ranges from 11.2% to 93.7%, depending on the target population and country,[4] with a market value of USD 87.5 billion in 2022 and is expected to reach USD 200.5 billion by 2032. It has been estimated that the self-administered medication market accounts for almost 8% of the total medication market worldwide.[5]

Self-medication has its own merits and demerits. It can relieve acute medical problems and save lives, save time spent on doctors' appointments, is economical, reduces the burden on the public health system,[6] and provides a cheaper alternative to treat common medical conditions.[7] On the contrary, inappropriate self-medication results in the wastage of resources, and an increase in resistance to pathogens and other serious hazards.[1,8]

A recent study from the central part of India on self-medication habits reported a prevalence of 60% across the population. The most used drugs for self-medication include antipyretics, antiallergics, antacids and antibiotics.[9]

Antibiotics are strong medications used to fight bacterial infections.[10] They are potentially life-saving drugs that kill bacteria or stop bacterial multiplication. However, a growing problem worldwide is antibiotic resistance (ABR), which is characterized by the diminished effectiveness of antibiotics against certain bacteria. This resistance is mainly caused by the overuse and misuse of antibiotics.[11]

Over the past few years, antibiotic resistance has emerged as a significant global public health concern, jeopardizing our ability to combat infectious diseases and eroding medical advancements. Each year, it is accountable for at least 700,000 deaths worldwide, with projections indicating a potential rise to 10 million annual fatalities by 2050, with a substantial portion in Asia.[12] Its impact is particularly underestimated in low- and middle-income countries (LMIC), where antibiotics are extensively used due to inadequate sanitation, limited diagnostic resources, and restricted access to alternative treatments.[12-14] While excessive usage, suboptimal dosages, and poor adherence to prescription guidelines are recognized as primary drivers of resistance, self-medication with antibiotics (SMA) has also been linked as one of the major reasons for the increase in antibiotic resistance.[12,15]

India is a large country with significant variations in literacy rates, cultures and accessibility to health care systems. This has led to variation in SMA practices amongst its' population across states. Some studies showed that SMA practices range from 3.31% in urban Kerala to 81.5% in rural Maharashtra.[16,17] This can lead to catastrophic effects and needs to be addressed properly.

College students exhibit a notable reluctance to seek health-related information, treatment, or healthcare services from professionals. They often turn to the internet instead, influenced by the pervasive presence of social media. This shift in behaviour raises concerns about self-diagnosis and self-medication practices among college students, particularly regarding antibiotic use.[15]

Special attention needs to be given to the behaviour of the medical students concerning SMA practices, as they are poised to become future leaders in clinical settings, where they will use their knowledge and positively influence patients' attitudes and behaviours toward SMA.

As there is a lack of comparative studies, this study was planned regarding the SMA practices between students of medical and non-medical streams.

METHODOLOGY

Ethical considerations: Relevant ethical clearance and approval to conduct the study were obtained from the Institutional Ethics Committee.

Study design and setting: This descriptive cross-sectional study was conducted across four medical colleges, 2 nursing colleges, and 13 non-health sciences Institutions which comprised 8 engineering and technology institutions and 5 institutions affiliated with multidisciplinary universities including a curriculum on arts, humanities, sciences, and social sciences. The study was conducted from August 2023 to February 2024.

Study participants: All undergraduate students aged 18 years and over currently enrolled in the first to fifth year were included regardless of the stream of undergraduate program. All the students who gave consent to participate in the study were included.

Questionnaire: The questionnaire items were created, assessed, and pre-validated by a committee of experienced senior faculty members and modified after initial pilot testing. Pilot-testing data were not used in the final analysis.

The questionnaire comprised sections like the socio-demography of the participants, self-medication behaviours with antibiotics and knowledge and perceptions of antibiotic usage for the intended purpose and potential adverse effects.

The respondents could select their answers from the given options, choose between the response alternatives of yes, no, not sure, or fill in their responses depending on the question type.

Sample size calculation: The sample size required for this study was determined using the formula N = Z^2*P*(1 - P)/E^2.(18) In this equation, "N" represents the sample size, "Z" denotes the standard normal deviation, typically set at 1.96 for a 95% confidence interval, "P" indicates the assumed prevalence, and "E" signifies the acceptable margin of error. Given the limited literature available on self-medication practices of antibiotics among undergraduate students, a prevalence of 50% (P-value = 0.5) was utilized to maximize variability. The acceptable margin of error (E) was set at 5% (P-value = 0.05). Subsequently, applying these values to the formula yielded an initial sample size estimation of approximately 384 participants. Factoring in a design effect of 1.5, the calculated sample size was adjusted to 576. In pursuit of obtaining more representative data, it was decided to collect responses twice the calculated sample size (n=1175) to increase the statistical power of the study.

Data collection: Data was collected online via Google Forms. A self-developed, pre-validated questionnaire consisting of both open-ended and close-ended items was used to collect all the relevant information.

The research information sheet and informed consent form were made available to study subjects online, using Google form. This sheet introduced the research team and outlined the study's objectives and its potential public health impact. Participants were informed that their involvement was voluntary, that they could withdraw at any point without repercussions, and that their responses would remain confidential and anonymous. Additionally, it was communicated that the data would be aggregated and published collectively. Contact information for the research team was provided for any queries.

To participate in the study, they were asked to log in via Google account and independently sign an informed e-consent form by clicking on it, after which the questionnaire would appear on the screen. Logging into a personal Google account prevented multiple submissions by a student. This questionnaire had three distinct sections comprising 44 questions in total.

Respondents were asked to complete the questionnaires autonomously.

Statistical data analysis: The data were extracted from the Google form responses in .xlsx format in Microsoft Excel. Incomplete responses were detected and excluded from the final dataset. After organising and presenting the data in the form of tables, the results were analysed using Microsoft Excel and standard online statistical tools[19] to find any statistical significance. For quantitative data, Chi-square test/Fisher's exact test and for continuous data, Student's *t*-test was applied, wherever applicable. All the relevant data was stored securely to maintain confidentiality. The identification of the volunteers was not revealed anywhere.

RESULTS

Five hundred out of 541 students from non-medical streams (92.4%) and 625 out of 634 students from medical streams (98.6%) gave consent to take part in the study (n=1125). Given that having a doctor as a parent implies that medications are being prescribed under professional supervision and cannot be accurately classified as self-medication, we excluded participants with a parent who is a doctor from the final analysis. Finally, 465 students from non-medical streams and 548 students from medical streams were included in the study (n=1013).

The mean age was 22.63±6.14 years and 20±1.77 years for non-medical and medical groups respectively and was comparable. The medical group included more female nursing students. (table 1).

Self-medication in the last 1 year was reported by 34.8% of non-medical students and 45.1% of medical students (p = 0.669).

Table 1: Socio-demographic comparison of two groups:

Socio-demographic variables	Non-medical student group [n_{nm}(%)=465]	Medical student group [n_m(%)=548]
Age	22.63±6.14	20±1.77
Gender		
Male	299 (64.3)	193 (35.2)
Female	166 (34.7)	355 (64.8)
Religion		
Christianity	6 (1.3)	31 (5.7)
Hinduism	380 (81.7)	263 (48.0)
Islam	39 (8.4)	19 (3.5)
Sikhism	31 (6.7)	219 (40.0)
Buddhism	9 (1.9)	16 (2.9)
Jainism	8 (1.7)	0 (0.0)
Prefer not to say	0 (0.0)	16 (2.9)
Type of family		
Joint	159 (34.2)	128 (23.4)
Nuclear	306 (65.8)	420 (76.6)
Residential area		
Rural	307 (66.0)	415 (75.7)
Urban	158 (34.0)	133 (24.3)
Addiction		
None	422 (90.8)	515 (94.0)
Yes		
Smoking	22 (4.7)	7 (1.3)
Tea/Coffee	7 (1.5)	15 (2.7)
Mobile	10 (2.2)	11 (2.0)
Alcohol	4 (0.9)	0 (0.0)

n_{nm} = non-medical group, n_m = medical group, p<0.05 is significant

Table 2: Comparison of self-medication with antibiotics (SMA) habits among medical and non-medical students

	Non-medical student group [n_{nm}(%)=465]	Medical student group [n_m(%)=548]	Chi-sq	p-value
Consumption of antibiotics in the last 1 year				
No	146 (31.4)	76 (13.9)	45.169	<0.001
Yes	319 (68.6)	472 (86.1)		
Consumption of antibiotics during the last 1 year without consulting a doctor				
No	157 (33.8)	225 (41.0)	0.182	0.669
Yes	162 (34.8)	247 (45.1)		
Gender of students who did self-medication with antibiotics (n_{nm} =319, n_m=472)				
Male (n_{nm} 128, n_m 147)	76 (59.4)	102 (69.4)	6.313 (Non-medical)	<0.001 (Non-medical)
Female (n_{nm} 191, n_m 325)	86 (45.0)	145 (44.6)	7.9 (Medical)	0.005 (Medical)
Study year of students who did self-medication (n_{nm} =162, n_m=247)				
First year	33 (7.1)	36 (6.6)	2.054 (non-medical)	0.726 (non-medical)
Second year	29 (6.2)	45 (8.2)	11.17 (medical)	0.025 (medical)
Third year	41 (8.8)	67 (12.2)		
Fourth year	30 (6.5)	51 (9.3)		
Fifth year	29 (6.2)	48 (8.8)		
Number of occasions of self-medication with antibiotic within last year (n_{nm} =162, n_m=247)				
One time	42 (25.9)	72 (29.1)	7.82	0.098
Two times	53 (32.7)	61 (24.7)		
Three times	28 (17.3)	43 (17.4)		
Four times	11 (6.8)	35 (14.1)		
More than four times	28 (17.3)	36 (14.5)		

n_{nm} = non-medical group, n_m = medical group, p<0.05 is significant

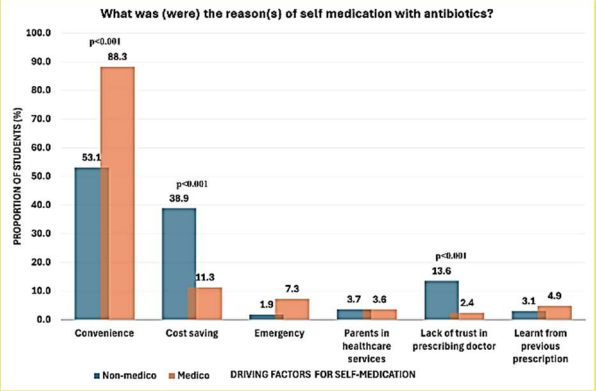

Figure 1: Comparison of driving factors for self-medication with antibiotics (p<0.05 is significant, only statistically significant p values are mentioned)

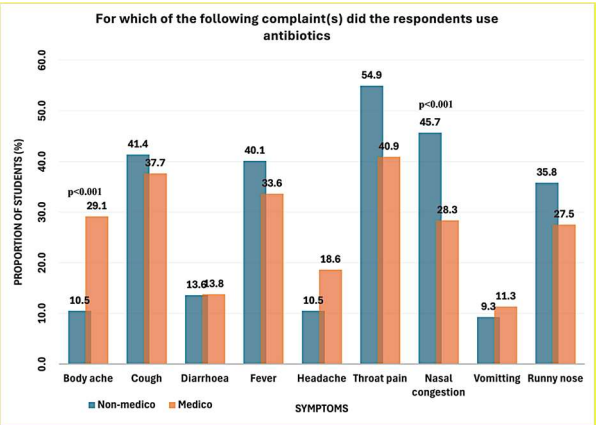

Figure 2: Comparison of complaints for which self-medication with antibiotics was done (p<0.05 is significant, only statistically significant p values are mentioned)

Gender played a role, with 76 males and 86 females among non-medical students (p<0.001), and 102 males and 145 females among medical students self-medicating (p = 0.005). Additionally, medical students in more advanced years were more likely to self-medicate (p = 0.025). Most students self-medicated one or two times. It was also found that the stream of education did not influence the frequency of SMA with antibiotics (table 2).

As shown in Figure 1, significantly higher numbers of medical students chose 'Convenience of getting an antibiotic' whereas significantly higher numbers of non-medical students chose 'cost saving' and 'lack of trust in doctors' as their major driving factors for practising SMA (figure 1).

As per Figure 2, throat pain was the most common complaint for which SMA was done in both groups, though the difference was insignificant. Significantly higher numbers of medicos did SMA for body aches, whereas significantly higher numbers of non-medico did it for nasal congestion (both p<0.001).

In Figure 3, medical group relied on the opinion of friends followed by academic experience (both p<0.001), when compared to non-medical groups), while students of the non-medical group relied on recommendations of local medicine shops for SMA (p<0.001).

As shown in Figure 4, a significant number of students in the medical group considered indications/types of antibiotics/trust in the pharmacists as the major factors for choosing an antibiotic (p<0.001). In contrast, a significantly higher number of non-medical students focused on the price of the antibiotics, symptoms and time taken for relief as the major factors for selecting an antibiotic (p<0.001).

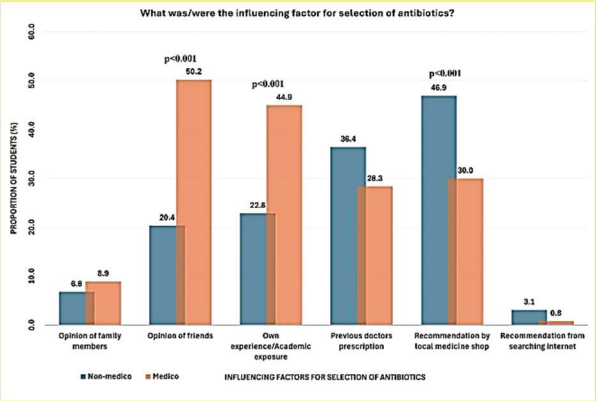

Figure 3: Comparison of influencing factors for selection of antibiotics (p<0.05 is significant, only statistically significant p values are mentioned)

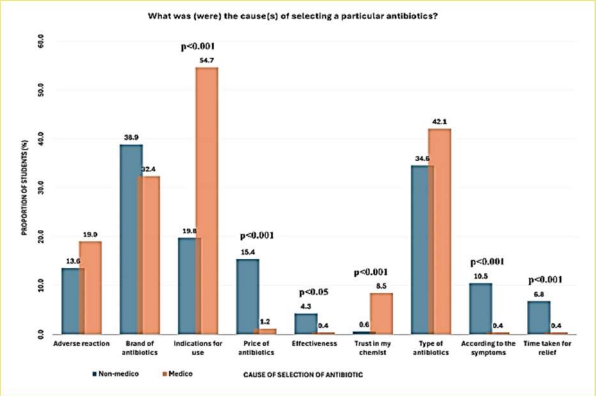

Figure 4: Comparison of causes of selection of antibiotics (p<0.05 is significant, only statistically significant p values are mentioned)

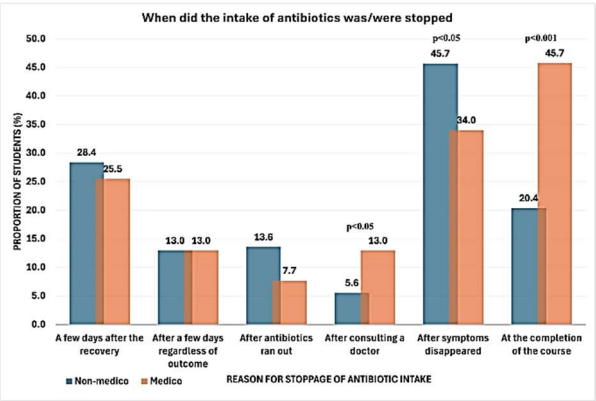

Figure 5: Comparison of timing of stopping antibiotics (p<0.05 is significant, only statistically significant p values are mentioned)

Elaborating the results further, local medicine shops were a common source (79.0% of non-medical vs 88.7% medical) to obtain an antibiotic, whereas Online websites or e-pharmacies were used by 9.3% of non-medical students and 5.26% of medical students. Interestingly, 14.2% of non-medical students reported using services of Registered Medical Practitioners (0.4% in medicos, p<0.001). About 21.0% of non-medical students and 13.6% of medical students reported to never read the package insert (p = 0.003). 45.0% of non-medical students and 36.0% of medical students checked the instructions "always".

Regarding their understanding of the instructions, 11.7% of non-medical students and 10.28% of medical students reported not understanding the instructions at all. However, 39.0% of non-medical students and 36.0% of medical students partially understood them, while 49.2% of non-medical students and 53.8% of medical students fully understood the instructions (p=0.015).

Consulting the person at the medicine shop for dosage information was much more common among non-medical students (49.4%) compared to medical students (30.4%, p < 0.001). Additionally, internet searches for dosage information were used by 23.5% of non-medical students and 7.7% of medical students (p< 0.001). Lastly, academic or previous experience influenced dosage decisions for 33.3% of non-medical students and 45.8% of medical students (p = 0.013). Study found that 40.1% of non-medical students and 48.6% of medical students admitted to sometimes changing the dosage, while 16.7% of non-medical students and 6.07% of medical students reported always changing the dosage during treatment (p = 0.002).

A statistically significant difference among two groups was seen regarding the cause of changing the dosage (p = 0.003), where 40.2% of non-medical students and 60.0% of medical students reported that they did so as their condition was not improving (p<0.003). To reduce adverse reactions, 20.7% of non-medical students adjusted their dosage (vs 8.2% of medical students, p= 0.006). It was seen that 53.7% of non-medical students and 47.4% of medical students reported never switching antibiotics during a disease. However, 37.0% of non-medical students and 49.4% of medical students sometimes switched antibiotics, and 9.3% of non-medical students and 3.2% of medical students always switched (p=0.005).

A significant number of non-medical students compared to medico students changed the antibiotic as newer was cheaper. (25.3% vs 4.6%, p<0.001). Meanwhile, 54.7% of non-medical students and 64.6% of medical students switched because the previous antibiotic didn't work.

Half students (50%) in both groups took single antibiotic for a single illness. 8.0% of non-medical students and 2.4% of medical students took more than three antibiotics (p = 0.004).

It was found that a statistically significant difference was present among the two groups regarding the experience of the occurrence of adverse effects (24.1% non-medical vs 11.3% medical) after doing SMA (p<0.001), while 75.9% of non-medical students and 88.7% of medical students reported never having adverse reactions.

In Figure 5, when compared to their counterpart, a significantly higher number of medical students stopped the antibiotic either after the completion of the course (p<0.001) or consulting a doctor (p<0.05), whereas, significantly higher numbers of non-medico students stopped the antibiotics as soon as the symptoms disappeared (p<0.05).

The majority of the students of the non-medico group either consulted a family member or the staff at the medicine shop (>50% combined) to treat the side effects of self-administered antibiotics, whereas medico students consulted a physician to get treated for the adverse effects.

As reported by our respondents of both groups, the most common antibiotics were used Amoxicillin + Clavulanic acid followed by Azithromycin.

The medical group had significantly higher self-confidence about treating themselves with antibiotics (p=0.035), but also regarded this approach as unsound practice (p<0.001) when compared to the non-medical group. Students from the non-medical group use other modalities of treatment (eg. Unani, ayurveda, homoeopathy) along with allopathy (p<0.001). It was also found that significantly less numbers of students in the non-medical group had satisfactory knowledge about antibiotics and had less knowledge about the term 'antibiotic resistance' (p<0.001, Table 3).

Table 3: KAP (Knowledge, attitude and practice) about antibiotics among medical and non-medical students

	Non-medical student group [n_{nm}(%)]	Medical student group [n_m(%)]	p-value
View about self-medication with antibiotics (n_{nm} =162, n_m=247)			
Acceptable practice	82 (50.6)	136 (55.1)	<0.001
Good practice	45 (27.8)	29 (11.7)	
Unacceptable practice	35 (21.6)	82 (33.2)	
View about treating common infections with antibiotics successfully (n_{nm} =162, n_m=247)			
No	20 (12.3)	29 (11.7)	0.035
Not sure	79 (48.8)	91 (36.8)	
Yes	63 (38.9)	127 (51.4)	
Detailed knowledge about word 'antibiotics' (n_{nm} =465, n_m=548)			
No	89 (19.1)	81 (14.8)	<0.001
Maybe	114 (24.5)	24 (4.4)	
Yes	262 (56.3)	443 (80.8)	
Knowledge about indication of antibiotics usage (n_{nm} =465, n_m=548)			
Bacterial infection	194 (41.7)	382 (69.7)	<0.001
Diseases causing microorganisms	3 (0.7)	3 (0.6)	
Fungal infection	146 (31.4)	81(14.8)	
Parasitic	15 (3.2)	42 (7.7)	
Viral infection	169 (36.3)	70 (12.8)	
Knowledge regarding following statements being correct about antibiotics (n_{nm} =465, n_m=548)			
Broad spectrum antibiotics are better than narrow spectrum	216 (46.5)	367 (67.0)	<0.001
Higher doses result in faster recovery	148 (31.8)	80 (14.6)	
Intravenous (IV) antibiotics are better than oral antibiotics	94 (20.2)	178 (32.5)	
Lower doses result in less adverse reaction	101 (21.7)	135 (24.6)	
Switching antibiotics enhances drug effects	82 (17.6)	78 (14.2)	
Switching antibiotics reduces adverse reactions	70 (15.1)	58 (10.6)	
Knowledge about the term 'antibiotic resistance' (n_{nm} =465, n_m=548)			
Yes	193 (41.5)	376 (68.6)	<0.001
No	272 (58.5)	172 (31.4)	

n_{nm} = non-medical group, n_m = medical group, p<0.05 is significant

Table 4: Factors associated with self-medication with antibiotics as per binary logistic regression

Variable	Attribute	aOR (95% CI)	p-value
Antibiotic Use in Last Year in Year One of Course	Non-Medicals	0.352 (0.258-0.480)	0.000
Reason (Convenience)	Cost Saving	0.175 (0.105-0.292)	0.000
Reason (Convenience)	Lack of trust in Prescribing Doctor	0.108 (0.042-0.274)	0.000
Knowing dosage of antibiotics (Medicine Shop)	From previous experience/academic exposure	2.232 (1.420-3.508)	0.000
Antibiotics used for complaints (Bodyache)	Cough	0.440 (0.244-0.793)	0.006
Antibiotics used for complaints (Bodyache)	Throat pain	0.462 (0.260-0.821)	0.008
Change in dose of antibiotics	Yes	0.347 (0.173-0698)	0.003
Reason for change in Antibiotics	To reduce adverse effects	0.264 (0.114-0.612)	0.002
Medicine can be Counterfeit	Agree	2.144 (1.137-4.042)	0.018
Stopped antibiotics	After antibiotics ran out	0.356 (0.166-0.766)	0.008
SMA is a Good Practice	Agree	0.389 (0.266-0.668)	0.001

aOR=adjusted Odds Ratio; CI = confidence interval

The adjusted odds ratio (aOR) for being a first year of non-medical student was 0.352 (95% CI: 0.258-0.480, p-value = 0.000, table 5), indicating that first-year medical students were more likely to self-medicate with antibiotics than the first year of non-medical students.

Discussion

The study aimed to assess the practice of self-medication with antibiotics, as well as the knowledge and attitude of the students across medical and non-medical streams of study. This assessment helped to reflect the current practice trends of the younger generation.

The current study discovered that the rate of SMA practice was higher in medical students compared to non-medical students (45.1% vs 34.8%, p=0.669, table 2). This pattern contradicted the findings of studies conducted by Sarahroodi et al. and Shitindi et al. conducted in Southern Iran and Tanzania respectively, where non-medical students exhibited higher engagement in self-medication practices.[7,20-23] SMA prevalence in this research was lower than in the studies done in Nepal, UAE and Sudan, whereas the prevalence is higher than the study done in Italy and Iran[7,20-23] The difference in the prevalence of SMA in different countries may be due to the diversity in pharmaceutical regulations in different countries. Moreover, demographic variations also can be considered as a factor for this. The current study also found that more male students of both groups were practising SMA than females, and the difference was statistically significant (table 2). This may be due to males being more comfortable to get medicines from different sources. This finding is similar to the studies done by Nair et al and Azad et al and opposite to the study done by Kumar et al.[24-26]

In this analysis, it was discovered that, third-year students of both the groups did self-medication the most, which can be attributed to the exposure of third-year MBBS students to pharmacology.

Additionally, a significantly larger number of medical students choose convenience as the reason for practising SMA. This may be due to relatively easier access to the medicines at the college, ward or hospital pharmacies. In a highly populated country like India, it's common thinking that a visit to a doctor takes time due to long-standing queues at the chamber. Moreover, due to less stringent regulations, antibiotics are easily available in local pharmacies, which saves both time and money. Some studies support our findings and establish the fact that public awareness must be raised by different modes of efforts to address this issue.[15,27,28]

This study documented that, medical students mostly relied on their academic experience and peers' opinions to choose the antibiotics and the doses, whereas their non-medical counterparts relied on recommendations from the local medicine shops or the internet for it. This phenomenon could be explained by the theoretical knowledge and clinical exposure acquired by medical students during their studies, which non-medical students lack. Surprisingly, a significant number of students from non-medical groups got medicines from unlicensed practitioners. These kinds of practices increase the risk of misdiagnosis, treatment failure, and severe adverse drug reactions. Similar observations were reported by Shitindi et al, Mandal et al and Kumar et al. in their studies.[15,26,27]

The study unveiled that a significantly higher number of students from the medical group altered their antibiotic during the treatment course as the initial antibiotic was ineffective and failed to improve their symptoms. This kind of practice is dangerous, and we think that curiosity and enthusiasm regarding drugs lead to this illegitimate practice for themselves and others. A study by Khadka et al also reported similar kind of findings in medical students of Kathmandu.[7]

A notably greater proportion of medical students expressed concerns about receiving duplicate antibiotics. Conversely, a smaller number of medical students discovered that they were prescribed the same antibiotic under a different name. The pharmacological literacy of medical students may have contributed to this heightened sense of vigilance.

The present study revealed a positive attitude towards taking a full course of the antibiotic regimen amongst the medical group of students. 45.75% of students said that they had stopped the antibiotics after full completion. However, it is to be noted that the result is much lower when compared to other studies available from other countries like Tanzania and eastern Ethiopia.[15,30] At the same time, a significantly higher number of students from non-medical groups stopped taking antibiotics once the symptoms disappeared. A study by Buke et al. at Ege University, Turkey had similar kind of findings amongst medical and non-medical students.[31] Additionally, the study found that a significantly lesser number of students from both groups had experienced adverse reactions after taking self-prescribed antibiotics, and most of them were experiencing nausea and diarrhoea after practising SMA, which is in concordance with the results of other studies[32,33] It was surprising to find that, most non-medical students discussed the issue of side effects with their family members only and never consulted a doctor. This kind of practice is mostly due to illiteracy regarding the harmful effects of self-medication with antibiotics and it needs to be addressed.

The findings of this study followed the trend seen among medical and non-medical undergraduates in Ghana, Northern India, Sri Lanka, Northwest Nigeria and Karachi of using amoxicillin and clavulanic acid as the most commonly used antibiotics.[27,33-37] Its superior absorption, availability in any health facility,

affordability, broad spectrum effectiveness, and safety profile make it a go-to drug for SMA practices among the population.

It was revealed that almost 2/3rd students who did SMA think that it is either an acceptable or good practice. Though the number of medical students who had similar thoughts was significantly lesser, it is a matter of concern that students who are studying MBBS carry a wrong attitude towards modern medical practice. Not only that, 48% of medical students did not have the confidence that they could treat a common infectious disease by themselves. These findings are similar to studies held in Tanzania and UAE.[15,38] The only assuring finding was that significantly more students from the non-medical stream doubted their ability to treat themselves with an antibiotic. This finding should be an eye-opener for us, and policies should be made to convert this doubt into awareness to prevent increased frequency of SMA practice.

Upon examining the response rates regarding basic knowledge of antibiotics and antibiotic resistance, an expected finding emerged, revealing that a significantly larger proportion of medical students provided correct responses. Similar findings were observed in the studies done by Shah et al. and Gillani et al. from Pakistan.[37,39]

The findings of this research will assist the development of interventions in college and university training curricula and guide policymakers to enhance training on appropriate antibiotic use, aiming to change the students' behaviour.

Strength and Limitations

The strengths of the study include double sample size and inclusion of multiple universities providing a generalised picture, and being the first of its kind having such a diverse respondents spread across geographical variation in India. A few advantages of using google forms are the flexibility of responses, ease of use, automatic data sheet formation, instant feedback, time-saving, more accessibility and real-time collaboration between the investigators.

This study had a few limitations. The google form have some inherent limitations/disadvantages such as issues of internet connectivity, risk of cheating among peers, difficulty in the matter of 'subjective' grading, risk of data loss due to technical issues, being a complex tool for unfamiliar cohorts and limitations of personalised and detailed feedback. It also had the chance of recall bias, as it relied on participants' recollections of antibiotic use 12 months before the survey. Although students were asked to complete the questionnaire independently, mutual influence cannot be ruled out. Moreover, the data is based on university students and thus represents only an educated portion of the general population.

Conclusion

The study highlights significant differences in SMA practices between medical and non-medical students. Medical students showed a higher prevalence of SMA, driven by easier access to antibiotics, and having academic knowledge. Non-medical students, however, often relied on local medicine shops and unlicensed practitioners for antibiotic recommendations. Both groups exhibited unsafe practices, such as altering doses or switching antibiotics without proper guidance, potentially leading to adverse effects and increased risks of antibiotic resistance. A concerning number of students, especially from non-medical groups, showed a lack of awareness regarding the harmful effects of improper antibiotic use, mirroring global trends and emphasizing the need for public health interventions.

Based on the findings, educational interventions should be integrated into the curriculum to promote responsible antibiotic use. Emphasizing the risks of self-medication, educating about proper antibiotic administration, and raising awareness of antibiotic resistance are essential to curb SMA practices. Additionally, stricter pharmaceutical regulations and improved access to affordable healthcare can help reduce the need for self-medication. Efforts should be made to ensure that students, particularly in non-medical fields, are well-informed and cautious in using antibiotics, fostering a shift towards safer health practices.

Acknowledgement

We want to thank Dr Sandeep Puri, Ex-Principal and Ex-Professor of the Department of General Medicine and Dr Sandeep Kaushal, Dean of Academics and Head of the Department of Pharmacology of our institute for their valuable inputs in planning and conducting this study.

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