

**SELF-MEDICATION AMONG DENTAL UNDERGRADUATE STUDENTS WITH ANTIBIOTICS:  
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**ABSTRACT**

Introduction: Though self-medication with antibiotics (SMA) is a potential contributor to resistance among pathogenic organisms to antibiotics, very few studies have evaluated pattern and prevalence of SMA among dental students.

Objective: The study was conducted to compare features of practice of SMA among second year undergraduate dental students and BDS students pursuing internship (interns) of a North Indian dental college.

Methods: This was a cross-sectional, anonymous, descriptive study with a six-month illness recall. Dental undergraduate students were administered a questionnaire consisting of both open and close-ended questions regarding various aspects of self-medication with antibiotics. The students were categorized into two groups for the comparative study. Group 1 comprised BDS second year students who were unexposed to pharmacology subject and Group 2 comprised interns possessing a sound knowledge of pharmacology. Written informed consent was taken from all the participants. Comparison between the two groups was done by chi-square test.

Results: A total of 150 respondents participated in the study. 51.3% (n=39) students in group 1 and 74.3% (n=55) students in group 2 had self-medicated in the last six months, the antibiotics most commonly used being amoxicillin (53.8% vs. 29.1%) and azithromycin (34.5% vs. 28.2%). The most common indications for SMA included common-cold, cough and sore throat, fever and diarrhea. Most of the respondents procured antibiotics from pharmacies (68.4% vs. 85.1%) after consulting previous prescription or parents.

Conclusion: SMA was significantly higher and inappropriate in the senior dental undergraduate cohort compared to the junior cohort, calling for effective interventional strategies to promote rational use of antibiotics.

**Keywords:** antibiotic resistance, dental students, self-medication

**INTRODUCTION**

Self-medication is the selection and use of medicines by individuals to treat self-recognized illnesses or symptoms. Responsible self-medication requires that medicines used are of proven safety, quality and efficacy and indicated for the conditions that are self-recognizable. [1]

Responsible self-medication can help prevent and treat minor ailments that do not require specialized medical consultation and reduce the pressure on medical services. These benefits translate into better productivity as well as cost savings to healthcare budgets, especially in less privileged countries with limited healthcare resources. However, self-medication can easily slip towards 'irresponsible' or 'inadequate' practice such as self-medication of prescription drugs, promoting drug dependence and/or drug misuse. [2-6] It can also be fatal sometimes.

Antibiotics are one of the most commonly prescribed drug classes. [7] Although non-prescription use of antibiotics, also termed self-medication with antibiotics (SMA) can potentially shorten the period of illness, reducing both the length of symptoms and period of infectivity; it is a well-recognized form of inappropriate drug use as it comprises the use of antibiotics in inadequate indications, such as for common cold or upper respiratory viral infections, a discrepancy between the drug's antimicrobial spectrum and the agents causing a disease, inadequate dosing and duration of treatment. [8]

Apart from their therapeutic uses in medical field, antibiotics have also been overused across the world in agriculture, animal husbandry and the food industry. It is difficult to demonstrate a proven causal link between antibacterial usage resulting from self-medication and resistance to them because of the multifactorial nature of the problem and difficulty of controlling the confounding factors. [9]

SMA is encouraged by the easy availability via over the counter (OTC) sale. [10, 11] In few cases, antibiotics initially prescribed by physicians are saved and subsequently used without medical consultation (left-over antibiotics). The indiscriminate and inappropriate use of antibiotics puts selective pressure on organisms, and encourages resistant microbes to thrive; this phenomenon drives the development of drug resistance. The emergence of resistance is a function of exposure to antimicrobials in terms of individual treatments, total usage and the passage of time, although these factors affect different pathogens and drugs variably. For example, widespread use of erythromycin led to resistance to *streptococcus pyogenes*, which reversed subsequent to reduced usage. [12] The history of antibiotic resistance has been an arms race between the pharmaceutical scientists developing new agents and the bacteria developing resistance mechanisms against them owing to mutations.

Problems created by indiscriminate and non-judicious use of antibiotics have escalated the emergence of resistant strains of pathogenic organisms, such as methicillin resistant *staphylococcus aureus* (MRSA), vancomycin-resistant enterococci (VRE), multi-drug resistant tuberculosis (MDR TB), penicillin-resistant pneumococci, multidrug resistant *pseudomonas aeruginosa*, extended spectrum beta lactamase (ESBL) producing enterococci, and *clostridium difficile*. [13-16] With the emergence of extensively-drug resistant (XDR) strains, TB is becoming more and more difficult and expensive to treat. [13, 14] In a multivariate analysis, use of an antibiotic prior to TB diagnosis was associated with increased overall diagnostic delay and subsequent health care delay. [15]

SMA among students, termed 'a silent epidemic' is a global problem. [2] The consequences of inappropriate self-medication among healthcare professionals have severe implications including legal, ethical, health defects, negative impacts on patient and quality of

health care delivery. [17] Prior to any intervention for promoting rational antibiotic administration, it is prudent to determine the magnitude of SMA and the factors that contribute to this practice. Therefore, the present study was conducted with an aim to assess the prevalence of SMA, the clinical conditions treated, type of antibiotics used for self-medication, reasons for adopting self-medication behavior, source of information for drug use and compare these factors among junior and senior undergraduate dental students.

## MATERIALS AND METHODS

This cross-sectional, descriptive study was conducted at a teaching dental hospital in North India. A pre-tested, self-administered questionnaire consisting of both open-ended and close-ended questions was distributed among second year dental students and interns, after explaining the nature and purpose of the study. Written informed consent was obtained.

The questionnaire contained questions pertaining to demographic data, indications for use of antibiotics, type of antibiotic used, reasons for adopting self-medication behavior, guiding source of information about antibiotics and source of antibiotics. It also assessed students' knowledge regarding antibiotic resistance.

**Operational definition:** SMA includes use of antibiotics obtained directly from a pharmacy, leftovers from treatment courses prescribed earlier and antibiotics obtained from relatives or friends or other sources without a specialist's consultation.

Data was expressed as counts and percentages. Statistical comparison of data between the two groups was done using the two tailed chi-square test of significance; p value less than 0.05 was considered statistically significant. Some of the questions had multiple responses to choose from; therefore sum total of percentages was more than 100%.

## RESULTS

Out of 156 students who participated in the study, 74 second year students and 76 interns completed the questionnaire correctly giving a response rate of 94.8% and 97.4%. Group 1 had participants aged between 18-21 years age whereas group 2 comprised participants aged between 22-25 years. Majority of the participants in both the groups were females (78% vs. 82%).

A large number of the respondents reported the presence of antibiotics at home (85.5% vs. 79.7%). 51.3% (n=39) students in group 1 and a significantly higher number of interns [74.3% (n=55); p=0.035] in group 2 reported use of antibiotics at least once in the preceding 6 months. Common cold, sore throat, cough, fever and diarrhea were the main ailments for which SMA was practiced. Common cold and sore throat were the predominant indications for taking antibiotics in group 1 and group 2 respondents respectively [Table 1].

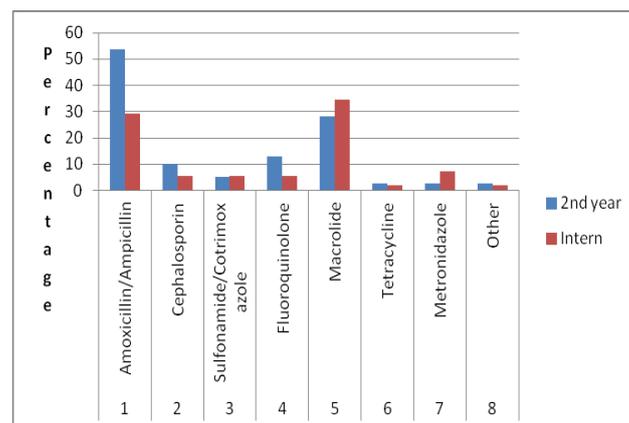
**Table 1: Disease conditions treated with non-prescription antibiotics**

S.No.	Clinical condition	Group 1 N (%)	Group 2 N (%)	P value
1.	Sore throat	11(28.2%)	24(43.6%)	.1269
2.	Fever	7(17.9%)	10(18.1%)	1
3.	Cough	10(25.6%)	8(14.5%)	.1785
4.	Common cold	16(41%)	15(27.2%)	.1626
5.	Dental infection	2(5.1%)	4(7.2%)	1
6.	Diarrhoea	7(17.9%)	8(14.5%)	.6547
7.	Other(eg-skin infection)	4(10.2%)	5(9%)	1

### N=the number of respondents

In group 1, penicillins were used for SMA - amoxicillin being the most common. However in group 2, drug class most frequently used was macrolides; azithromycin was the most commonly used antibiotic. Other antibiotics used less frequently were

cephalosporins, fluoroquinolones and metronidazole [Figure 1]. The length of use was mostly less than five days. A few students admitted to not completing the full course of antibiotics (15.3% vs. 18.1%).



**Figure 1: Antibiotics used by the two groups**

The major reason given by both groups for adopting self-medication behavior was a similar past experience, lack of time and good knowledge of drugs [Table 2].

**Table 2: Reason for self-medication with antibiotics**

S.No.		Group 1 N (%)	Group 2 N (%)	P value
1.	Similar past experience	16 (41%)	23 (41.8%)	.9203
2.	Good knowledge of antibiotics	8 (20.5%)	13 (23.6%)	.7184
3.	Lack of time	10 (25.6%)	18 (32.7%)	.4583
4.	Easy availability of antibiotics	6 (15.3%)	9 (16.3%)	.8875
5.	Other(e.g-high cost of private consultation)	1 (2.5%)	2 (3.6%)	1

N=the number of respondents

Though the major guiding source for drug information was previous prescription in both the groups, parents' advice influenced a large number in group 1 [Table 3].

**Table 3: Guiding source for self-medication**

S.No.		Group 1 N (%)	Group 2 N (%)	P value
1.	Previous prescription	18 (46.1%)	29 (52.7%)	.5323
2.	Pharmacist	8 (20.5%)	4 (7.2%)	.0685
3.	Parents	16 (41.0%)	15 (27.2%)	.1626
4.	Friends	5 (12.8%)	6 (10.9%)	1
5.	Self	2 (5.1%)	5 (9.1%)	.6955

### N=the number of respondents

The source of procurement of antibiotics was pharmacy store (68.4% vs. 85.1%) followed by home medicine cabinet (28.9% vs. 12.1%).

A large number of second year students were unclear about correct antibiotic usage and the factors responsible for the development of antibiotic resistance. Three-fourth respondents (76%) correctly agreed that completing the full course of antibiotics will prevent development of resistance whereas more than half of the participants (59%) incorrectly agreed that viral infection should be treated with antibiotics; half of the respondents believed that drug-drug interactions contributed to resistance in bacteria. They agreed that SMA could promote resistance (64%). On the other hand, interns were more knowledgeable about factors contributing to resistance [Table 4].

Table 4: Knowledge about usage and resistance to antibiotics among the two groups

S.No.	Statements evaluating knowledge about antibiotics	Group 1 Correct answer N(%)	Group 1 Incorrect answer N(%)	Group 2 Correct answer N(%)	Group 2); Incorrect answer N(%)	P value
1.	Antibiotic resistance is promoted by using antibiotic when they are not needed	59(77.6%)	17(22.3%)	63(85.1%)	11(14.8%)	.2384
2.	Antibiotic resistance is promoted by not completing the full course of antibiotics	58(76.3%)	19(25%)	67(90.5%)	7(9.4%)	.0133*
3.	Antibiotic resistance is promoted by self-medication with antibiotics	49(64.4%)	27(35.5%)	57(77%)	17(22.9%)	.0914
4.	Antibiotic resistance is promoted by using the antibiotic with another drug(drug-drug interaction)	38(50%)	38(50%)	51(68.9%)	23(31.1%)	.0184*
5.	Use of antibiotic may lead to allergy and subsequent death	48(63.1%)	28(36.8%)	56(75.6%)	18(24.3%)	.0966
6.	Viral infection with fever should be treated with antibiotics	45(59.2%)	31(40.7%)	56(75.6%)	18(24.3%)	.0316*
7.	An antibiotic will always be effective in the treatment of same infection in the future	56(73.6%)	20(26.3%)	61(82.4%)	13(17.5%)	.1963

N=the number of respondents; \*p<0.05, on comparison between two groups (chi-square test)

## DISCUSSION

Our study shows a high prevalence of antibiotic usage among dental students. In concordance to our study, students reported a high rate of SMA in other studies. [18-23] More number of interns self-medicated as compared to second year undergraduates and the difference was statistically significant. This can be attributed to aggressive management of minor ailments interns using their knowledge. The tendency to indulge in self-medication behavior would be expected to decrease with increase in age and year of study owing to better knowledge and rational drug use expected from interns, but our results do not conform to this. [5, 20] In a study by James et al, senior students had a more confident as well as concerned attitude towards self-medication and tended to practice self-medication often. [21] A doctor's own health concern and rational drug usage can influence the counseling and care he provides to patients. A practitioner with poor health practices is less likely to counsel his patients about good healthcare. [24]

SMA constitute a major form of irrational use of medicine that can cause significant adverse effects such as drug toxicity, the lack of therapeutic effect, increase in treatment cost, prolonged hospitalization, the emergence of bacterial resistance to antimicrobial agents, progression of the disease and morbidity. [8, 25] The students have an easy access to information about drugs from drug indices, medical literature and colleagues. Our study reflects that misplaced confidence can lead to inappropriate self-medication. [3] Medical students who self-medicate may not have a dispassionate appreciation of a medical situation and it is hard for them to know at what point they have stepped over the line. [26] Moreover, lack of implementation of proper regulatory control and supervision over OTC sale of antimicrobials leads to easy availability and facilitates the practice of self-medication.

The most common symptoms that led students to practice self-medication were common cold, sore throat, cough and fever and diarrhea. Acute respiratory tract infections (ARIs) account for a large share of community antibiotic use in many countries. [18-20] Antibiotic treatment is only occasionally indicated and is not necessary in viral infections. Improper selection and sub-optimal duration of treatment due to earlier discontinuation of antibiotics when symptoms improve compound the problem. Emergence of multi-drug resistant strains further limits the therapeutic options for clinicians. Additionally, irrational use of antibiotics may lead to adverse effects such as enteropathy (irritable bowel syndrome), and superinfections such as antibiotic-associated diarrhea.

Besides a number of socio-economic characteristics and cultural beliefs, the determinants of SMA in developing countries include educational level, lack of access to healthcare, weak drug regulatory practices, unused previous prescriptions at home, cost of medical consultation, inappropriate knowledge and ignorant attitude towards the consequences of self-medication. [10, 11, 23, 27, 28]

Penicillin, macrolides and quinolones were the most common antibiotics used for self-medication in other studies also [19, 29] For treatment of gastrointestinal infections, an Indian study found metronidazole, enterokinol and norfloxacin-tinidazole to be the most commonly self-medicated drugs. [30]

The main factors influencing the choice of antibiotics were previous experience with the same illness and lack of time. [31] Given their limited clinical experience and high levels of work stress, students may not be able to judge when to seek medical advice. The misperception of the students regarding disease may invite serious health hazards. [6] The guiding sources included parents and pharmacists, who may not have the requisite professional knowledge required to render quality health advice. [19] Majority of the respondents reported presence of antibiotics in home medicine cabinet. This allows for easy access, promoting reuse of leftover antibiotics.

Majority of the students obtained the antibiotics from a drug store. OTC availability of antibiotics invariably promotes wider sales and overusage in the community. Moreover, it is not justified in many cases. For example, OTC availability of azithromycin for treatment of chlamydial genital infection is questionable. Though it treats the infection, it fails to address the possibility of co-existing sexually transmitted diseases, contact tracing, prevention and health education. A prescription is the only way to connect surveillance of resistance to surveillance of antimicrobial use and non-prescription usage decreases the chances of obtaining any useful epidemiological information. [9]

As expected, interns were more knowledgeable than second year dental students regarding theoretical knowledge about antibiotic usage, yet their practice of SMA is far from being appropriate. There is need to bridge knowledge gaps between students' perceptions and rational antibiotic use. Responsible self-medication should be incorporated as an intrinsic component of their curriculum as they are the future health care professionals.

The medical community, the public health and regulating agencies, as well as pharmaceutical companies, need to expand efforts to control antibiotic resistance beyond initiatives centered on prescription trends. Epidemiological data of antimicrobial resistance in the community is a useful guide in formulating the therapeutic interventions and promoting rational drug use. [12] Increased regulation of Internet sites for the sale of antibiotics is needed. [32] Besides drug regulation, awareness campaigns with media support are needed. Successful implementation of international antibiotic regulations can be supported by urging pharmacists to dispense antibiotics according to the number of days stated by the physician and not in preset pack sizes. [33, 34]

**Limitations of the study:** Since the study was done on a small sample of a specific region, results cannot be generalized. The main

limitation of this study is that the data collected were self-reported which may introduce some bias in the behaviors of the respondents studied. Some issues regarding subjectivity and imprecision may have crept in as mutual influence between the students could not be ruled out. The reported data may represent an underestimation of the problem as students may choose not to reveal such data.

## CONCLUSION

Compared to their junior counterparts, SMA in senior professional dental students is highly prevalent and inappropriate. The knowledge of pharmacology probably has led to a false sense of confidence in self-diagnosis and self-management leading the interns to self-prescribe irrationally. Alternatively, drug-related knowledge and easy access might have encouraged their SMA practice. There is need to increase awareness and implement legislations to promote judicious and safe practices.

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