

A cross-sectional study on knowledge, attitude, and behavior related to antibiotic use among undergraduate medical students in a tertiary care medical college, Kashmir

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ABSTRACT

Background: Antibiotics represent one of the most prescribed drugs worldwide. The overuse and misuse of antibiotics are key factors contributing to antibiotic resistance. It is estimated that more than 50% of antibiotics are purchased without a proper prescription. Self-medication with antibiotics has been identified as one form of irrational use contributing to increased morbidity and mortality. Antibiotic self-medication assumes a special significance among medical students as they are the future medical practitioners. The objective of this study was to assess the frequency of antibiotic self-medication among medical students and their knowledge and perception about antibiotic use and its dangers.

Methods: Pre-validated questionnaires were distributed among 300 medical students by simple randomization out of which 246 were returned completely filled. The analysis was done by manual calculators, VassarStats, and SPSS. Results are expressed in frequencies and percentages.

Results: The prevalence of antibiotic self-medication among medical students was found as high as 80.89%. It was also observed that the gender of the respondents did not influence significantly the practice of antibiotic self-medication. The majority (52.26%) of the respondents used penicillins, mostly for upper respiratory tract infections (88.94%). The major source of antibiotics was medical stores (87.93%). Most of the respondents (57.58%) stopped the antibiotics after symptoms disappeared. It was found that the student's knowledge improved as they progressed in their study. However, the senior students scored poorly on the behavior/practice toward the use of antibiotics.

Conclusions: There is an urgent need to improve education on antibiotic use in medical curricula. Furthermore, strict policies must be enforced to regulate dispensing of antibiotics.

Keywords: Antibiotic usage, Medical students, Self-medication, Questionnaire survey

INTRODUCTION

Antibiotics have marked a revolution in human history by limiting the spread of diseases and thereby saving billions of lives. It is argued that antimicrobials have done more to improve public health during past five decades than any other measure.¹

Antibiotics are the most frequently prescribed drugs, but they are often misused.²

Antibiotic misuse is a worldwide problem and has resulted in the development of resistance, resulting in high morbidity and mortality; with implications of health care costs, failure

of treatments, hospitalization, and clinic visits.³ Global irrational use of antibiotics is on a rise, despite public awareness and concern of health care providers.

A survey conducted by Princeton University revealed that antibiotic use increased by 36% globally in the past decade (between 2000 and 2010).⁴ The CDC estimates that up to 50% of antibiotic prescriptions are unnecessary or inappropriate.⁵

Antibiotics also have their own side effects and hazards, which need to be considered, in particular for the people with other co-morbidities. Among other factors self-medication with antibiotics has been identified as one form of irrational

use.⁶ Self-medication with antibiotics is a common practice in many countries in the world but tends to carry more significance in the developing world.⁷

One of the documented predictors of self-medication is a level of education.⁸ Medical students represent a highly educated group of medical personnel and their knowledge, attitude, and behavior in relation to usage of antibiotics can greatly impact the future on antibiotic related issues.⁹

Medical students being in the profession where they are exposed to knowledge about disease and drugs can practice self-medication with antibiotics.¹⁰ Self-medication with antibiotics assumes a special significance in them as they are future medical practitioners and have a potential role in counseling the patients about proper antibiotic use.¹¹ Being a future pillar of health care providing system medical student's skills and knowledge in this regard are decisive. If medical students cannot be trusted to acknowledge and seek appropriate care as a patient for their health, can they be trusted to care appropriately for their patients?

With abovesaid concern and to help address these problems, and also to provide a basis for relevant measures this study was undertaken. The objectives of this study were:

- I. To assess the frequency/prevalence of antibiotic self-medication among undergraduate medical students
- II. To find the factors behind this behavior
- III. To assess the students knowledge and perception about antibiotic use and its dangers.

METHODS

Study design

It was a questionnaire-based study categorized on knowledge, attitude, and practice. It was designed mainly to assess the students understanding of antibiotics and practice of antibiotic self-medication.

Sample size calculation was done to determine the population required for the study.

Sample size calculation

$$n = pq / (E/1.96)^2$$

Where,

n=Minimum sample size,

p=prevalence of self-medication in previous studies, = (82.3%)¹²

$$q = 100 - p(100 - 82.3) = 17.7$$

E=margin of sample error tolerated (%)

=5% i.e. 95% confidence interval

$$n = \frac{82.3 \times 17.7}{(5/1.96)^2}$$

$$= 224$$

(224 was the sample size required).

Study population

A total of 300 undergraduate students of SKIMS Medical College, Srinagar were given a pre-validated questionnaire.

Inclusion criteria

- i. All undergraduate MBBS students
- ii. Willing to participate in the study.

Exclusion criteria

- i. Interns, house surgeons, registrars, and consultants
- ii. Not willing to participate in the study.

Sampling method: Simple random sampling.

Study tools: Pre-tested questionnaire which was prepared in English.

Questionnaire

The structured questionnaire was created by reviewing relevant literature and questionnaires used previously in similar studies. The questionnaire consisted of both closed-ended and open-ended questions. The first part of the questionnaire investigated socio-demographic characteristics of the students interviewed, such as age, gender, and class/grade. The second part was designed to evaluate the consumption of antibiotics in the last 1 year. In the third part, the knowledge, attitude and behaviors about antibiotics and their usage were assessed.

The questionnaire was pre-tested for content and design on 30 students from the target population to clarify any ambiguities and suitable modifications were done.

Table 1: Characteristics of study population.

Class	Males (%)	Females (%)	Total
Class level wise students: n (%)			
First professional	40 (48.78)	42 (51.21)	82
Second professional	41 (47.12)	46 (52.87)	87
Third professional	35 (45.45)	42 (54.54)	77
Total	116 (47.15)	130 (52.84)	246

Table 2: Respondents knowledge about antibiotics related issues n (%).

Class	Yes (%)	No (%)	Total
First professional	65 (79.26)	17 (20.73)	82
Second professional	85 (97.70)	02 (2.29)	87
Third professional	77 (100%)	-	77
Total	227 (92.27)	19 (7.72)	246

Table 3: Respondents attitude and behavior about antibiotic use.

Class	Yes n (%)	No n (%)	Total
Self-medicators n (%)			
First professional	63 (76.83)	19 (23.17)	82
Second professional	70 (80.45)	17 (19.54)	87
Third professional	66 (85.71)	11 (14.28)	77
Total	199 (80.89)	47 (19.10)	246
Class	Male	Female	Total
Genderwise self-medicators n=199			
First professional	30 (47.61)	33 (52.38)	63
Second professional	33 (47.14)	37 (52.85)	70
Third professional	34 (51.51)	32 (48.48)	66
Total	97 (48.74)	102 (51.25)	199
Class	Frequently	Occasionally	Total
First professional	19 (30.15)	44 (69.84)	63
Second professional	39 (55.71)	31 (44.28)	70
Third professional	34 (51.51)	32 (48.48)	66
Total	92 (46.23)	107 (53.76)	199

Table 4: Reasons for self medication.

Variable	n (%)
Previous experience	82 (41.20)
Lack of time	41 (20.60)
Prescription resubmission	35 (17.58)
Minor illness	41 (20.60)
Total	199 (100)

Participating as well as undeclared pre-testing was done. The final version of the questionnaire was used.

Ethical considerations

The study was approved by the Institutional Ethics Committee. The anonymity of the participants was maintained, and ethical principles followed. Before the administration of questionnaires, the background and intentions of the survey were explained, and students were encouraged to participate without any undue pressure. Returning of the completed survey was accepted as consent by the participating students. Participation was voluntary, anonymous and without compensation.

Data analysis

The analysis was done by combination of manual calculators, VassarStats, and SPSS v20. The analysis was carried out using descriptive statistics at 95% confidence intervals. Results were expressed in frequencies and percentages. The questionnaires which were incompletely filled were excluded from the study. Some of the questions had multiple options to choose from; therefore, the sum total of percentages is not always 100%.

Table 5: Diseases treated (due to multiple ticks, sum of %age more than 100).

Disease(s)	n (%)
Fever, cough, cold, sore throat	177 (88.94)
Diarrhea	10 (5.02)
Skin infections	07 (3.51)
Acne	05 (2.51)
UTI	10 (5.02)
Oroidental	08 (4.02)

Due to multiple options respondents could select sum of percentage is not 100

Table 6: Antibiotics used.

Antibiotic	n (%)
Amoxicillin/amoxclav	104 (52.26)
Macro/azalides	83 (49.74)
Aminogly (streptomycin)	03 (1.50)
Tetracycline	06 (3.01)
Cephalosporins	27 (13.56)
Fluoroquinolones	66 (33.16)

Due to multiple options respondents could select sum of percentage is not 100

RESULTS

Out of 300 questionnaires distributed, only 264 were returned by the students giving a response rate of 88%. Out of these only 246 questionnaires were found completely filled. Hence, data of only 246 participants were considered for the study and the rest were excluded. Out of 246 participants, 82 were from first professional, 87 from second professional and 77 from the third professional.

Table 7: Antibiotic use and other related factors

Variables	n (%)
Fluoroquinolones	
Norflox	8 (12.12)
Cipro	24 (36.36)
Levo	13 (19.69)
Moxi	05 (7.57)
Oflo	16 (24.24)
Who suggested the drug	
Pharmacist	41 (20.60)
Family/friends	36 (18)
Previous experience	82 (41.20)
Netizens	05 (2.51)
Previous prescription	35 (17.58)
Total	199
Source of drug	
Pharmacy	175 (87.93)
Left overs	16 (8.04)
Samples	08 (4.02)
Total	199
Who told the dose?	
Pharmacist	52 (26.13) (first MB 30 [57.69%])
Text books	27 (13.56)
Self guess	43 (21.60)
Prev prescription	14 (7.03)
Friend/family	22 (11.05)
Package insert	20 (10.05)
Internet	21 (10.55)
Total	199
When antibiotic(s) was stopped?	
After symptoms disappear	115 (57.78)
After a few days	25 (12.56)
After full recovery	52 (26.13)
Till drug last	07 (3.51)
Total	199
Changed antibiotic/dose during therapy	32 (16.08)
Total	199
ADR felt	
Allergy	03 (1.50)
Nausea/vomiting	14 (7.03)
Metallic taste	05 (2.51)
Jaundice	04 (2.01)
Diarrhea	16 (8.04)
Total	42

ADR: Adverse drug reaction

Out of 246 participants, 116 (47.15%) were males and 130 (52.84%) were females.

79.26% (n=65) first professional, 97.70% (n=85) second professional and 100% (n=77) third professional students were well aware about basic facts about antibiotics including consequences of their misuse and overuse.

199 participants (80.89%) accepted to have indulged in antibiotic self-medication in preceding 1 year, out of which 76.83% (n=63) were from first professional, 80.45% (n=70) from second professional and 85.71% (n=66) were from third professional.

48.74% (n=97) self-medicators were male and 51.25% (n=102) were female. 46.23% (n=92) admitted to have taken more than six antibiotic courses during preceding 1 year and 53.76% (n=107) less than that during the same period.

88.94% took antibiotics without a valid prescription for respiratory symptoms/diseases, 5.02% for diarrheal diseases, 3.51% for skin infections, 2.51% for acne, 5.02% for urinary tract infection (UTI) and 4.02% for orodental problems. 52.26% used amoxicillin alone or amoxicillin with clavulanic acid, 49.74% macrolides, 33.16% fluoroquinolones, 13.56% cephalosporins, 3.01% tetracyclines, and 1.50% aminoglycosides.

Among fluoroquinolones, ciprofloxacin (36.36%) was the most commonly used, followed by ofloxacin (24.24%), levofloxacin (19.69%), norfloxacin (12.12%), and moxifloxacin (7.57%).

When the most common reason for self-medication was analyzed, 41.20% cited the previous experience of treating similar illness as a reason for antibiotic self-medication, 17.58% thought that they had a recurrence and re-submitted previous prescriptions to purchase the antibiotics, 20.60% (mostly first professional students) thought that their illness was minor and did not require doctor's consultation, 20.60% cited lack of time as a reason for antibiotic self-medication.

87.93% purchased the drugs from medical stores, 8.04% used leftover antibiotics and 4.02% used antibiotic samples. To know about dosage, etc. 26.13% consulted their pharmacists (mostly first professional students), 13.56% medical textbooks, 7.03% previous prescriptions, 11.05% family/friends and 10.05% package insert. 21.60% made a self-guess and 10.55% searched the internet to know about the dose.

57.78% stopped the antibiotics as soon as their symptoms disappeared, 12.56% after a few days irrespective of the outcome, 3.51% until the antibiotics last. Only 26.13% completed the course. 16.08% changed either the antibiotic or its dose during the course. 21.10% admitted having experienced adverse effects during treatment which included allergic reactions (1.50%), nausea and vomiting (7.03%), diarrhea (8.04%), metallic taste (2.01%), and jaundice (2.01%) (Tables 1-7).

DISCUSSION

This study sought to identify the knowledge, attitudes, and behaviors of undergraduate medical students regarding antibiotic use/issues and to ascertain if there were factors associated with these main outcomes of interest. This study provides useful information about the knowledge, attitudes, perceptions and the practices of medical students with respect to antibiotic usage, which may be utilized to plan suitable educational interventions that aim at improving the antimicrobial prescribing and use.

Prevalence

In this study, the prevalence of antibiotic self-medication among undergraduate medical students was found high. 80.89% participants admitted to have taken antibiotics in the last 1 year. Prevalence of antibiotic self-medication among students, reported in other studies was: China (75.29%),⁹ Khartoum (41%),¹³ Nigeria (38.8%),¹⁴ UAE (40.2%),¹⁵ Jordan (63.9%),¹⁶ and Punjab India (74%).⁶

Male:female

This study found out that the gender of the respondents did not influence significantly the practice of antibiotic self-medication. In another study, the number of males was 57.66% and a number of females was 42.4%.¹⁷ But in a study conducted in UAE majority of respondents 89.5% were females.¹⁵

Attitudes and behaviors toward antibiotic use

While exploring the influence of the medical curriculum on student's knowledge, attitude and practice regarding antibiotic use at different semester/grade levels, it was found that the student's knowledge improved as they progressed in their study attaining the highest scores at third professional level. However, the senior students (second and third professional) scored poorly on the behavior/practice toward the use of antibiotics. These results are concurrent with the results of a similar study on 2500 Chinese students.⁹ In another study, it was observed that the longer the time spent at medical school, the more were students prone to use antibiotics without a medical prescription.¹⁸ Despite the fair good level of knowledge, high rates of incorrect behaviors were noticed. Hence, it seems like despite having a sufficient theoretical background, medical students do not practice what they learn.

Diseases treated

This study revealed that most of the students (88.94%) self-medicated with antibiotics for upper respiratory infections. A study conducted in Jordan showed that 67.1% of the participants believed that antibiotics could treat common cold and cough.¹⁹

In another study, it has been found that respiratory symptoms were the most common reason for self-medication with antibiotics.²⁰

In another study, the prominent diseases that predisposed respondents to self-medication practices with antibiotics were UTI (43.5%), typhoid (4.9%), dysentery (10%), cough and catarrh (6.8%), diarrhea (10.2%), malaria (5.5%), sore throat (15.3%), otitis media (2%), and pneumonia (1.8%).²¹

Antibiotics used

The majority of respondents in this study used penicillin group of antibiotics (especially amoxicillin, amoxicillin/clavulanic acid). These results are concurrent with another study on medical undergraduates in Nigeria.¹⁴ In the present study, macrolides were the second most common used antibiotics (49.74%) followed by fluoroquinolones (33.16%).

In another study 48.9% students used amoxicillin/clavunate, 27% amoxicillin, 10.1% penicillin, 6.7% azithromycin, 4.5% tetracycline, and 3.4% cephalosporin.¹⁵

Reasons for antibiotic self-medication

When the most common reasons for antibiotic self-medication were analyzed it was found that majority (41.20%) of the respondents cited "previous experience" of treating similar illness as main reason for antibiotic self-medication, 17.58% thought that they had a recurrence and resubmitted their previous prescriptions to purchase antibiotics, 20.60% considered their ailment as being mild enough not to require doctor's consultation, and same percentage (20.60%) revealed lack of time due to tight teaching schedule as a reason for antibiotic self-medication.

In a study on health care students in UAE, 27% cited "past experience" of treating same illness as a reason for antibiotic self-medication, 25.8% prescription resubmission, 21.4% pharmacist advice, 20.2% advice of friends/relatives.¹⁵

In another study, it was found that 51.8% took the antibiotics on relatives advice, and 49% used leftover antibiotics.¹⁹

Source of drug

This study revealed that majority of the students (87.93%) purchased antibiotics from local medical stores and 8.04% used leftover antibiotics. This is concurrent with various other studies that show that the main sources of medication are community pharmacies.^{15,22}

These findings expose a lope hole in the enforcement of laws on dispensing of medicine.

Drug stoppage

In this study, the majority of the respondents (57.78%) stopped the antibiotics as soon as the symptoms disappeared. Only 26.13% continued the antibiotic until full recovery. 16.08% changed either the antibiotic or its dose during the course. In another study, 62.5% students revealed taking antibiotics till complete recovery.¹⁵

In one more study, it was pointed out that 21.6% of the students always interrupt the antibiotic course if they start feeling better and give leftovers antibiotics to their friends or roommates.²³

Adverse drug reaction (ADR)

21.10% revealed that they experienced various antibiotic-related adverse effects. In another study 40.69% participants (mostly rural population) reported drug-related ADR.²⁴ This shows that adverse drug reactions are among one of the important potential risks of self-medication.

A limitation of this study included inherent associations of a self-administered questionnaire, i.e., recall bias in answering questions and accuracy of the recall of the information. This was minimized by using a standardized well-structured questionnaire. The fact that the study was carried in only one healthcare facility, these findings may not be representative of the whole student community. As this was a questionnaire-based study, students were expected to complete the questionnaire independently but mutual influence between the students could not entirely be ruled out.

CONCLUSION

The practice of antibiotic self-medication among medical students is a matter of grave concern. This study reveals that antibiotic self-medication is high among undergraduate medical students and the antibiotic misuse increases with an increase in class level. Data in this study indicate that there was no direct correlation between the student's knowledge, attitude, and behavior toward antibiotic use. The tendency to indulge in antibiotic self-medication would be assumed to decrease with increase in class level, as students become more knowledgeable about rational antibiotic use. However, the findings of this study contradict this assumption. Medical students need to be targeted repeatedly during their education and be taught the value of using antibiotics with caution. By not increasing the efforts to teach medical students to avoid overusing antibiotics, we are putting future patient's health at risk. The present study revealed that the major source of antibiotics used for self-medication by the respondents was medical stores, which exposes a loophole in the enforcement of laws on dispensing of drugs. Strict policies must be enforced to regulate sale of antibiotics and prohibit their purchase without a prescription.

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