

DOI: <http://dx.doi.org/10.18203/2319-2003.ijbcp20183936>**Original Research Article****A questionnaire based survey on knowledge, attitude and behaviour of antibiotic usage and resistance among undergraduates in South Indian teaching hospital****Nalinidevi Jayabalan, Nitya Selvaraj*, Suganya Ganesan,
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medium, provided the original
work is properly cited.**ABSTRACT****Background:** Antibiotic resistance has become a global threat in the field of medicine. Multiple causes like antibiotic abuse, irrational usage of antibiotics, over the counter availability of antibiotics etc., have been put forth as culprit leading to antibiotic resistance. The present study aims at evaluating the knowledge, attitude and behaviour of antibiotic usage and resistance among undergraduates in South Indian teaching hospital.**Methods:** A cross-sectional, questionnaire-based survey conducted in undergraduate MBBS students including 5th to 9th semester at Department of Pharmacology. The questionnaire comprised of: Demographic data; Knowledge including 12 questions using Four-point likert scale; Attitude and behaviours consisting of 8 questions of Yes/No type. Data were analysed in the software SPSS version 24.0. Association among categorical variable were analysed with Analysis of variance (ANOVA) followed by post hoc Bonferroni test.**Results:** Among 455, 382 students completed the survey instrument and the response rate was 87%. Statistically significant ($p=0.002$) results have been obtained for the correct responses of knowledge questionnaire. The order of "good knowledge" about antibiotic usage and resistance according to semesters are graded as VIII>VI>V. Unfortunately, there were no significant results seen with attitude and behaviour.**Conclusions:** The study concluded that, though there was adequate theoretical knowledge among undergraduate students however they lack in their attitude and behaviour regarding antibiotic usage and resistance. Therefore, they need to improve their attitude and behaviour over antibiotic usage and resistance.**Keywords:** Antibiotic resistance, Knowledge and attitude, Questionnaire survey, Undergraduate MBBS students**INTRODUCTION**Antibiotic resistance is a major threat worldwide.¹ Global utilization of antibiotic drugs elevated by 35% between 2000 and 2010.² Literature review revealed that there was high demand of antibiotic usage among low and middle-income countries.³

Self-medication is one of the commonest causes for the antibiotic resistance which is due to advises from families, friends, neighbours and the pharmacist, previous

prescribed drug, or suggestions from the advertisement in newspapers or popular magazines etc.⁴ The common cause for antibiotic resistance may be due to antibiotic misuse which is also called as antibiotic abuse or overuse. Over the counter availability of antibiotics, low-socio economic status and antibiotic being sold without a prescription by pharmacists are also documented as reasons for antibiotic resistance.⁵

In addition to the as mentioned reasons, inadequate treatment duration, improper selection of drug and dosage

also cause antibiotic resistance which urge to discover newer antibiotics to solve the antibiotic resistance.^{6,7} Less knowledge about antibiotic resistance among undergraduates, health care professionals, pharmacists lead to irrational usage of antibiotics among patients and is reported worldwide.⁵

Today’s students are tomorrow’s doctors. Hence in order to prevent antibiotic resistance, health care professionals should follow a rule of five rights of medication namely:

- Right drug
- Right patient
- Right dose
- Right duration
- Right route

And also, one should give a proper counselling about antibiotic usage and resistance.⁸

Further, a large number of foreign studies are available about knowledge, attitude, practice of antibiotic usage and resistance among undergraduates when compared to Indian studies.^{5,9-11} However periodic evaluation of usage of antibiotic knowledge is mandatory among health care professionals. This prompted me to evaluate knowledge, attitude and behaviour of antibiotic usage and resistance among undergraduate students.

The objective of the present research was to find out the level of Knowledge, Attitude and behaviour of antibiotic usage and resistance among the undergraduate students in South Indian Teaching Hospital

METHODS

A Structured self-administered questionnaire obtained from the work done by Scaioli et al, was given to the students after obtaining their informed written consent on a pure voluntary basis.¹¹ Information about the study and instructions to complete the questionnaire were given to the study participants by the investigator. Questionnaire includes three major categories viz

- Demographic information
- Knowledge
- Attitude and Behaviors regarding antibiotic usage and resistance.

The demographic information included were age, gender, semester and relatives working in health-related fields. Knowledge included 12 questions which were of Four-point likert scale type (strongly agree, agree, disagree, strongly disagree). Attitude and behaviours consisted of 8 questions of Yes/No type.

Statistical analysis

Data was analysed in the software SPSS version 24.0. Description of categorical variables like gender, semester

was mentioned in percentage. Data related to continuous variable like age were described in terms of mean and standard deviation. Association among categorical variables like semester, knowledge, attitude and behaviour were assessed by using one way ANOVA followed by post hoc analysis with Bonferroni test.¹² P value <0.05 was considered as statistically significant.

RESULTS

Total number of students from 5th to 9th semester were 455. Out of 455 students, 382 had given voluntary consent and participated in this study. That showed a valid response rate which was 87%.

Comparatively more number of females (52.9%) had participated than males. Overall mean age was 20.7±1.4. Particularly, the maximum respondents were from VI (33.5%), compared to other semesters shown in Table 1. Students about 154 (40.3%) confirmed at least one relative is working in health-related field.

Table 1: Demographic information of study participants.

Demographic details	Total subjects (N=382)	
Age	V Sem	19±0.5
	VI Sem	20±0.5
	VII Sem	22±0.5
	VIII Sem	22±0.5
	IX Sem	23±0.5
Gender	Male	180 (47.1%)
	Female	202 (52.9%)
Semester	V	118 (30.9%)
	VI	128 (33.5%)
	VII	17 (4.5%)
	VIII	104 (27.2%)
	IX	15 (3.9%)
Relatives working in health-related field	Yes	154 (40.3%)
	No	228 (59.7%)

Categorical variables like Gender, Semester are mentioned in percentage and Continuous variable like age is described in terms of mean±standard deviation.

Response about knowledge in antibiotic usage and resistance

Participants revealed good knowledge about antibiotic usage and resistance. The correct response for each question considered as “strongly agree” or “strongly disagree” depending upon statement.

As shown in Table 2, among 382 students, 342 (89.5%) strongly agreed that, penicillin is an antibiotic and more than 63% of medical students were aware that aspirin and paracetamol are not antibiotics.

Regarding knowledge about antibiotic role, highest percentage of students (83.5%) informed that, antibiotics were useful for treating bacterial infections but only lowest percentage of students i.e. 36% believed that antibiotics are not useful for viral infection and these drugs are not as same as anti-inflammatory agents.

With respect to knowledge about side-effects, only 40% of participants were conscious that “antibiotics can kill “good bacteria” present in our organism” and “antibiotics can cause allergic reactions” (44% and 49.5% respectively) which leads to ill health. Very low percentage of students (29.3%) strongly agreed that, antibiotics can cause secondary infections after killing good bacteria present in our organism. In response to knowledge about antibiotic

resistance, fair amount of participants (71.7%) informed that “Antibiotic resistance is a phenomenon for which a bacterium loses its sensitivity to an antibiotic”. More than 60% of participants accepted that, misuse of antibiotics can lead to antibiotic resistance. Even then 46.9% of participants stopped antibiotics when symptoms improved. Therefore, there was a remarkable depth of knowledge seen among participants. The semester wise comparison was done with one-way ANOVA followed by post-hoc Bonferroni test revealed that, V semester compared with VIII shows $p < 0.05$, VI semester compared with VIII shows $p < 0.005$, VIII semester compared with V and VI shows $p < 0.05$ and $p < 0.005$ respectively.

Table 2: Knowledge regarding antibiotic usage and resistance among the participants.

Topic	Statement	Semester (%)					N (%) n=382
		V	VI	VII	VIII	IX	
Identification of antibiotics	Penicillin is an antibiotic	109	113	13	94	13	342
	Correct answer: Strongly agree	(92.4%)	(88.3%)	(76.5%)	(90.4%)	(86.7%)	(89.5%)
	Aspirin is an antibiotic	69	70	9	82	11	241
Knowledge about antibiotic role	Correct answer: Strongly disagree	(58.5%)	(54.7%)	(52.9%)	(78.8%)	(73.3%)	(63.1)
	Paracetamol is an antibiotic	72	75	9	79	10	245
	Correct answer: Strongly disagree	(61.0%)	(58.6%)	(52.9%)	(76.0%)	(66.7%)	(64.1%)
Knowledge about antibiotic role	Antibiotics are useful for bacterial infections	95	106	14	92	12	319
	Correct answer: Strongly agree	(80.5%)	(82.8%)	(82.4%)	(88.5%)	(80.0%)	(83.5%)
	Antibiotics are useful for viral infections	43	39	4	50	3	139
Knowledge about antibiotic role	Correct answer: Strongly disagree	(36.4%)	(30.5%)	(23.5%)	(48.1%)	(20.0%)	(36.4%)
	Antibiotics are the same as anti-inflammatory agents	44	36	7	44	10	141
	Correct answer: Strongly disagree	(37.3%)	(28.1%)	(41.2%)	(42.3%)	(66.7%)	(36.9%)
Knowledge about side-effects	Antibiotics can kill “good bacteria” present in our organism	49	54	11	50	4	168
	Correct answer: Strongly agree	(41.5%)	(42.2%)	(64.7%)	(48.1%)	(26.7%)	(44.0%)
	Antibiotics can cause secondary infections after killing good bacteria present in our organism	28	43	4	34	3	112
Knowledge about side-effects	Correct answer: Strongly agree	(23.7%)	(33.6%)	(23.5%)	(32.7%)	(20.0%)	(29.3%)
	Antibiotics can cause allergic reactions	69	50	7	57	6	189
	Correct answer: Strongly agree	(58.5%)	(39.1%)	(41.2%)	(54.8%)	(40.0%)	(49.5%)
Knowledge about antibiotic resistance	Antibiotic resistance is a phenomenon for which a bacterium loses its sensitivity to an antibiotic	82	97	8	77	10	274
	Correct answer: Strongly agree	(69.5%)	(75.8%)	(47.1%)	(74.0%)	(66.7%)	(71.7%)
	Misuse of antibiotics can lead to antibiotic resistance	62	86	10	84	8	250
Knowledge about antibiotic resistance	Correct answer: Strongly agree	(52.5%)	(67.2%)	(58.8%)	(80.8%)	(53.3%)	(65.4%)
	It is okay to stop taking antibiotic when symptoms are improving	58	47	6	61	7	179
	Correct answer: Strongly disagree	(49.2%)	(36.7%)	(35.3%)	(58.7%)	(46.7%)	(46.9%)

Values are expressed as frequencies and percentages. n=Total number of participants, Frequency and percentage of participants who gave correct response based on semester of study

Table 3: Frequency and percentage of knowledge scores among study participants.

Semester	No. of participants (Total = 382)	Frequency and percentage Total=216 (57%)	P-value
Fifth semester	118	65 (55%)	F=4.359 P=0.002
Six semester	128	68 (53%)	
Seventh semester	17	8.5 (50%)	
Eighth semester	104	67 (64%)	
Ninth semester	15	8 (54%)	

Knowledge compared with V, VI, VII, VIII and IX semesters by using one-way ANOVA followed by post-hoc analysis with Bonferroni test. P value <0.05 was considered as statistically significant.

Table 4: Attitude and behavior regarding antibiotic usage and resistance among the participants.

Statement	Semester (%)					N (%) n=382
	V	VI	VII	VIII	IX	
Do you usually take antibiotics for cold or sore throat? Correct answer: No	65 (55.1%)	49 (38.3%)	7 (41.2%)	62 (59.6%)	8 (53.3%)	191 (50.0%)
Do you usually take antibiotics for fever? Correct answer: No	73 (61.9%)	76 (59.4%)	8 (47.1%)	66 (63.5%)	13 (86.7%)	236 (61.8%)
Do you usually stop taking antibiotic when you start feeling better? Correct answer: No	59 (50.0%)	71 (55.5%)	7 (41.2%)	58 (55.8%)	9 (60.0%)	204 (53.4%)
Do you take antibiotics only when prescribed by the doctor? Correct answer: Yes	89 (75.4%)	89 (69.5%)	11 (64.7%)	58 (55.8%)	12 (80.0%)	259 (67.8%)
Do you have leftover antibiotics at home? Correct answer: No	62 (52.5%)	60 (46.9%)	7 (41.2%)	52 (50.0%)	9 (60.0%)	190 (49.7%)
Do you use leftovers antibiotics when you have cold, sore throat or flu without consulting your doctor? Correct answer: No	78 (66.1%)	81 (63.3%)	11 (64.7%)	71 (68.3%)	14 (93.3%)	255 (66.8%)
Do you buy antibiotics without medical prescription? Correct answer: No	67 (56.8%)	65 (50.8%)	6 (35.3%)	54 (51.9%)	9 (60.0%)	201 (52.6%)
Do you start taking antibiotics only after a phone call with your doctor? Correct answer: Yes	54 (45.8%)	73 (57.0%)	9 (52.9%)	47 (45.2%)	10 (66.7%)	193 (50.3%)

Values are expressed as frequencies and percentages. n=Total number of participants. Frequency and percentage of participants who gave correct response based on semester of study.

Therefore, significant results obtained from knowledge of participants (p=0.002) as depicted in Table 3. The order of “good knowledge” about antibiotic usage and resistance according to semesters are graded as VIII>VI>V.

Response about attitude and behaviours

As illustrated in Table 4, Out of 382 students, 50% of participants opined that they won’t take antibiotics for cold, sore throat and for fever (61.8%). More than 50% of students refused to stop taking antibiotics which was advised by the clinician when they feel better and good number of students (67.8%) took antibiotics only when prescribed by doctor. About 49.7% of students did not have leftover antibiotics at home. Comparatively 66.8% of

students relayed that leftover antibiotics should not be taken when they had cold, sore throat or flu without consulting a doctor.

“Buying antibiotics without medical prescription” and “Start taking antibiotics only after a telephonic conversation with the doctor” were accepted by 52.6% and 50.3% of participants respectively. The results were analysed by using one way ANOVA followed by post-hoc test shows no significance as given in Table 5.

DISCUSSION

The augmented etiology for antibiotic resistance being poor prescription practices, self-medication, incorrect or

inappropriate usage of antibiotics, antibiotic abuse, over the counter availability of antibiotics.⁶ Henceforth the present study was aimed at assessing knowledge, attitude

and behaviour of antibiotic resistance and usage among undergraduates in South Indian Teaching Hospital.

Table 5: Frequency and percentage of attitude and behaviours scores among study participants.

Semester	Number of participants Total=382	Frequency and percentage Total=216(57%)	P-value
Fifth semester	118	68.3 (58%)	F=1.328 P=0.259
Six semester	128	70.5 (55%)	
Seventh semester	17	8.2 (48.5%)	
Eighth semester	104	51 (56%)	
Ninth semester	15	10.5 (70%)	

Attitude and behavior compared with V, VI, VII, VIII and IX semesters by using one way ANOVA followed by post-hoc analysis with Bonferroni test. P value <0.05 was considered as statistically significant.

In this present study, among 382 students, 89.5% and more than 63% were aware that penicillin is an antibiotic and aspirin and paracetamol are not antibiotics respectively. However, study done by Scaioli G et al, yielded better result of 96% and 95% respectively when same questions were asked to the participants.¹¹ Likewise present study revealed that majority of them (83.5%) were aware that antibiotics are useful for treating bacterial infections which is in accordance with a study done by Gary S et al, showing 70% positive response in medical students.¹³

But surprisingly 36.4% and 36.9% strongly disagreed that, antibiotics are useful for viral infections and they are same as anti-inflammatory agents. Similar results had been obtained from the study done by Huang Y et al, among 2500 Chinese medical students.¹⁴ Thus in order to rectify this lacuna, authors need to clearly emphasize the undergraduate medical students regarding the usage of antibiotics and also its pharmacological actions which can help them to practice in a better way.

It is also necessary for undergraduates to have clear knowledge regarding the adverse reactions caused by antibiotics. In the present study, 49.5% and 65.4% of students believed that antibiotic caused allergic reactions and misuse of antibiotics lead to antibiotic resistance respectively. Another study done by Gary S et al, had shown similar result and also stated that, misuse and inappropriate usage of antibiotic causes ill health.¹³

In fact the study revealed that, 80% of students believed that taking higher class of antibiotics for milder infections can lead to antibiotic resistance.¹⁰ Thriemer K et al, said that most of the participants agreed or strongly agreed that, antibiotic resistance occurred due to over usage of antibiotics which was in accordance with our study.¹⁵

With the availability of many antibiotics, it is necessary for the doctors to prescribe appropriate antibiotics in order to prevent emerging resistance pattern and it is a good sign

that the study participants had good knowledge about inappropriate usage of higher antibiotics.

Another major causative leading to resistance is non-compliance especially when symptoms disappear patients tend to stop medication paving way for antibiotic resistance. Nearly 46.9% were aware of the fact that antibiotics should not be stopped when symptoms were improving, in our study. A study conducted at Italy in general population by Napolitano F et al, had shown that, 50% of people were aware of the fact that incomplete antibiotic course can lead to lack of effectiveness.¹⁶

However, considering semester wise knowledge, VIII semester students were having good knowledge over identification of antibiotics and antibiotic role compared to all other semesters. Comparatively IX semester students were having lowest knowledge on side effects. Whereas VI and VIII semester produced fair responses over knowledge about antibiotic resistance. The order of "good knowledge" about antibiotic usage and resistance according to semester were graded as VIII>VI>V. This shows that the knowledge has considerably increased as they reach higher semester and the reason could be simultaneous clinical exposure which added more to theoretical knowledge of study participants.

Several studies done across the world on antibiotic usage and resistance listed that there was a lack of knowledge about antibiotic prescription and students need education about appropriate prescribing.¹⁷⁻¹⁹ Even in the present study authors obtained poor response for some basic questions. So, there is an ever-ending quest to update the knowledge regarding antibiotic usage among undergraduates throughout their study period.

There is a lot of gap between knowledge and attitude. Fortunately, in the present study when questions regarding attitude were asked, 49.7% and 66.8% of participants stated that left over antibiotics should not be taken and also

antibiotics should not be taken for cold, sore throat or flu without consulting doctor respectively. Similar results regarding left over antibiotics usage had been obtained from studies done by Scaioli G et al, in Italy and Gary S et al, in Jordan, but latter study had also shown that significant number of students had taken antibiotic without consultation with the doctor. Even though they have discussed about medication use, most of the students agreed that they changed the dose and duration on their own without the knowledge of doctor.^{6,11} In this study, about 204 (53.4%) students refused to stop taking antibiotics when they feel better. 259 (67.8%) students had taken antibiotics only when prescribed by the doctor. Similar results have been obtained from study done by Hsiao FY et al, among Taiwan students, but comparatively less number of students agreed in accordance with present study.¹⁹

Present study findings show that, 50% of students won't take antibiotics for cold, sore throat and 236 (61.8%) for fever. Remaining students believed that, antibiotic usage for these minor ailments lead to decrease in the course of illness and also caused better improvement. This misconception may be one of the reasons why antibiotics causes resistance. Similar results have been obtained from the study done by Mukharjee SK et al, and Khan AK et al.^{20,21}

Present study depicted that, knowledge, attitude and behavior among undergraduate, produced a drastic difference as the semester increased (i.e. VIII semester gave good response when compared to VI>V semester) due to clinical knowledge and exposure, but there was a slight lacuna seen over IX semester on antibiotic usage and resistance.

To achieve a target, intervention like special courses, workshops, conferences, group discussion should be conducted to improve appropriate antibiotic prescription practice for each year after they completed II-year MBBS. In fact, classes regarding antibiotic usage and resistance must be incorporated in third and final years if possible. Antibiotic misuse by the junior doctors can cause impact on the behaviour of antibiotic usage and resistance. Hence improving knowledge, attitude and behaviour of undergraduate is necessary and mandatory.^{14,15}

The limitations of the present study were the gold standard method of survey was face-to-face interview which can be incorporated in future studies to get better results. Survey was done only with limited number of participants. Study was done in single institution. Self-administered questionnaire can lead to recall bias.

CONCLUSION

The study concluded that, though there was adequate theoretical knowledge among undergraduate students however they lack in their attitude and behaviour regarding antibiotic usage and resistance. Therefore, they need to

improve their attitude and behaviour over antibiotic usage and resistance. To enhance the overall knowledge and attitude about antibiotics, students need special courses of education over rational prescription of antibiotics that highlight more on behaviour of undergraduate students towards antibiotic usage and resistance instead of improving knowledge alone.

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