



# Knowledge, Attitude and Practices Regarding Anti-Microbial Resistance among Medical Students in a Tertiary Care Centre, Puducherry-An Analytical Cross Sectional Study

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## Abstract

**Introduction:** Antibiotics being the life saver in many situations of emergencies has created the irrational use due to the change in pattern of prescribing and treatment. Health professionals play a key role in the fight against antibiotic resistance because they play a part in prescribing antibiotics during routine clinical practice as well as in promoting health education, particularly by encouraging patients to adhere to therapies and avoid self-medication. Unfortunately, the inappropriate prescription of antibiotics by some health professionals has proven to be a constant problem. Main lacunae faced is absence of capacity building in understanding the prescribing practices, so an initiative was taken to understand the Knowledge, attitude and practices among the medical students.

**Methodology:** The study was an analytical cross sectional study involving all the medical students who consented to participate. The questionnaire was used to assess the Knowledge, attitudes and practises in Anti microbial resistance, and data was collected and analysed and presented as descriptive and inferential statistics.

**Results:** Out of the 210 medical students 61.4% were female and 38.6% were males. Maximum students around 60% belonged to third year. About 93.3% were aware about Anti-microbial resistance, but only 46.2% were aware about the alarming rise of the resistance and only 74.3% has taken the complete prescribed course.

**Conclusion:** There are many lacunae in practising theory based knowledge into practise based knowledge among the medical students. So capacity building with tutorials and educating about the prescription practices by means of integration lectures to students will serve the purpose.

**Keywords:** Antibiotics; Microbial; Resistance

**Abbreviations:** WHO: World Health Organization; IEC: Institutional Ethics Committee.

## Introduction

The discovery of antibiotics is a major milestone that leads to the change in pattern and treatment of infectious diseases, however its irrational use has created a havoc of antibiotic resistance [1]. Antibiotics have saved countless millions of lives but have been often misused because of the misguided belief that they are harmless [2]. The gradual increase in several multidrug-resistant bacterial strains in the last couple of decades poses a dreadful threat in treating infectious diseases and is associated with increased treatment failure, longer hospital stay, higher medical costs, increased mortality, and a higher risk of disease spread [3]. Antimicrobial resistance has been detected globally and is considered to be one of the greatest challenges to public health, with further socioeconomic impact [4]. The World Health Organization (WHO) declared “World Antibiotic Awareness Week” from November 13 to 17, with an objective of improving “awareness and understanding of antimicrobial resistance through effective communication, education, and training” [5]. Both the WHO and the United Nations have identified the global scale of AMR and the need for global strategies. The WHO publication “Global Action Plan on Antimicrobial Resistance” sets out a global consensus that antimicrobial resistance poses a significant public health challenge emphasizing the paramount significance of achieving the five strategic objectives of the WHO Global Action Plan [2]. Health professionals play a key role in the fight against antibiotic resistance because they play a part in prescribing antibiotics during routine clinical practice as well as in promoting health education, particularly by encouraging patients to adhere to therapies and avoid self-medication. Unfortunately, the inappropriate prescription of antibiotics by health professionals has proven to be a constant public health issue posing a tremendous increase in resistance for the treatments followed in various clinical setups [6]. Since antibiotic resistance has become a worldwide public health concern and is in part related to physician’s lack of knowledge, it is essential to focus our attention on healthcare professional students [7]. There is a need to change the antimicrobial prescribing behaviour of doctors and future prescribers to reduce the magnitude of the problem of antimicrobial resistance. Medical students should not only be made aware of the current emerging health issues but also be directed towards rational antibiotics prescribing behaviour as future medical practitioners [8]. Therefore it is necessary to ascertain the understanding of future health practitioners; thus, the objective of this study was to assess the knowledge, attitude, and practices regarding antimicrobial resistance among undergraduate medical students in a private tertiary care hospital in Puducherry.

## Aim and Objectives

- To assess the knowledge regarding antimicrobial resistance among medical students, in a tertiary care centre.
- To assess the attitude regarding antimicrobial resistance among medical students, in a tertiary care centre
- To assess the practices regarding antimicrobial resistance among medical students, in a tertiary care centre.

## Materials and Methods

### Study Area

The present study was conducted in the Tertiary care centre catering to the health care needs of various villages in and outside Puducherry.

### Study Design

This study was an analytical cross-sectional study using a structured questionnaire, about the knowledge, attitude and practices regarding antimicrobial resistance.

### Study Population

The study participants were medical students, from first to final years of study and Interns of a private medical college of Puducherry.

### Study Period

The study was conducted between April 2023 and May 2023. The data was collected over a period of two months

### Sample Size

The sample size was not restricted to any value from previous studies; but included all the medical students across various years of study. Thus 210 medical students of the college consented to participate in this study.

### Sampling Technique

Universal consecutive sampling technique was used in this study to assess the knowledge, attitude and practices regarding antimicrobial resistance among medical students.

### Study Tool

A pre-validated and pre-tested structured questionnaire was developed consisting of four parts. The first part consists of Socio-demographic information like name, age, gender, year of study and the willingness to participate. The second part of the questionnaire included questions regarding knowledge on antimicrobial resistance. The third part of the questionnaire included questions regarding attitude towards antimicrobial resistance. The fourth part of the

questionnaire included questions regarding practices on antimicrobial resistance.

### Data Collection

The study protocol was presented to the Institutional Ethics Committee (IEC) and the approval was obtained. The study protocol was explained to the study participants and the informed consent was obtained through participant information sheet and the data collection was carried out by distributing the structured questionnaire via Google forms through google links, and email and the responses were collected.

### Data Analysis

The data obtained from the questionnaire for quantitative study was entered in Microsoft excel and analysed using SPSS software version 21. The results were presented in descriptive statistics as frequencies and percentages. Both continuous data categorical data were analysed and presented using statistical methods.

### Operational Definition

#### Antimicrobial Resistance

Antimicrobial resistance occurs when bacteria, viruses, fungi and parasites change over time and no longer respond to medicines making infections harder to treat and increasing the risk of disease spread, severe illness and death. As a result of drug resistance, antibiotics and other antimicrobial medicines become increasingly difficult or impossible to treat.

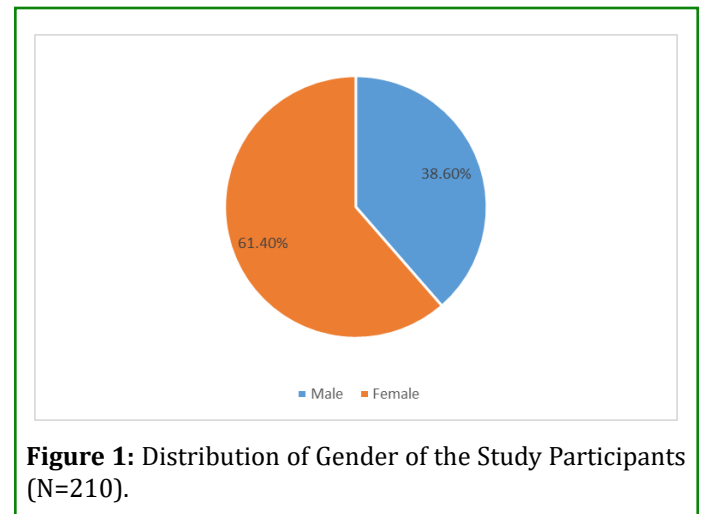
#### Antibiotic Resistance

Antibiotic resistance occurs when bacteria change in response to the use of these medicines. Bacteria, not humans or animals, become antibiotic-resistant. These bacteria may infect humans and animals, and the infections they cause are harder to treat than those caused by non-resistant bacteria.

### Results

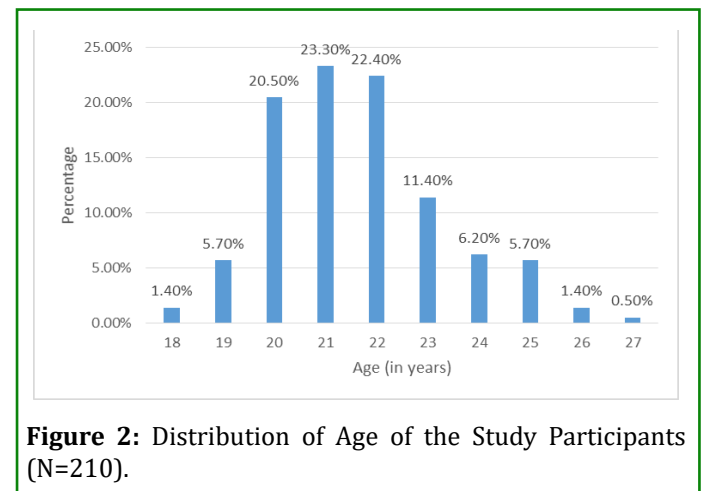
Out of the 210 medical students 61.4% were female and 38.6% were males. (Figure 1,2) Maximum students around 60% belonged to third year. (Figure 3) About 93.3% were aware about Anti-microbial resistance, but only 46.2% were aware about the alarming rise of the resistance and only 74.3% has taken the complete prescribed course. Thus the prevalence of knowledge for AMR is 93.3%, but the knowledge for treatment prescription is very less contributing to 47.1%. Only 59.5% knew the definition for antibiotic resistance. Also only 61.4% and 55.2% knew the adverse side effects of taking antibiotics like alteration of normal bacterial flora, allergies

and misuse of it. Only 61.4% knew about the emergence of resistance due to indiscriminate and injudicious use. When attitudes were assessed only 46.2% agree to the alarming rise of the resistance in the population to antibiotics. Only 50.5% feel the necessity for knowledge dissemination. About 61.4% told that the antibiotics which they took have worked effectively for them. Only 77.1% felt the need for health education regarding the AMR. Only 74.3% told that they took the full complete prescribed course of antibiotics (Table 1-3). Figure 4 shows the distribution of diseases for which the antibiotics were taken. Table (4-6) showed the categorical distribution of awareness and its association with the year of study among medical students.



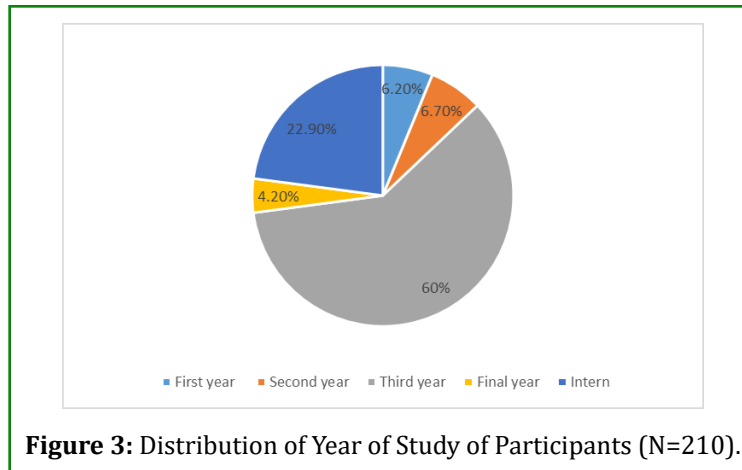
**Figure 1:** Distribution of Gender of the Study Participants (N=210).

It was observed that majority, 61.4% (n=129) of the participants in this study were female and 38.6% (n=81) participants were male.



**Figure 2:** Distribution of Age of the Study Participants (N=210).

It was observed that 50.9% (n=107) of the study participants belong to the age group of 18-21 years, while 45.7% (n=96) of them belong to the age group of 22-25 years and the rest 3.4% (n=7) belong to the age group of >25 years.



**Figure 3:** Distribution of Year of Study of Participants (N=210).

It was observed that maximum participants, 60% (n=126), were in their third year of study, followed by Interns, with 22.9% (n= 48) participation and 6.7% (n=14), 6.2% (n=13),

4.2% (n=9) participants were from their second, first and final year of study respectively.

S.No	Questions	Yes	No	Uncertain
K0	Do you know about antimicrobial resistance	93.30%	6.70%	-
K1	Antibiotics are effective for the treatment of bacterial infections.	89%	6.70%	4.30%
K2	Antibiotics are effective for the treatment of viral infections.	46.20%	33.80%	20%
K3	Antibiotics are effective for the treatment of both bacterial and viral infections.	47.10%	31.40%	21.40%
K4	Antibiotic resistance is the loss of activity of an antibiotic.	59.50%	29.50%	11%
K5	Missing an antibiotic dose contributes to antibiotic resistance.	56.20%	22.40%	21.40%
K6	Antibiotic resistance can be caused by the overuse of antibiotics.	78.10%	10.50%	11.40%
K7	Consumption of antibiotics without physician's prescription can contribute to antibiotic resistance.	72.90%	9%	18.10%
K8	Antibiotics are indicated to reduce any kind of pain and inflammation.	44.30%	7.60%	18.10%
K9	Antibiotics kill 'normal flora' present in our body.	61.40%	17.60%	21%
K10	Antibiotics cause secondary infections after killing normal flora present in our body.	55.20%	23.30%	21.40%
K11	Antibiotics can cause allergic reactions.	70.50%	10%	19.50%
K12	Misuse of antibiotics can lead to a loss of sensitivity to a specific pathogen.	78.60%	8.10%	13.30%
K13	If symptoms improve before the full course of therapy is completed, you can stop taking it.	33.80%	54.80%	11.40%
K14	Antibiotic resistance is an important and serious public health issue.	83.30%	5.70%	11%
K15	Antibiotic resistance is a phenomenon in which a bacterium loses its sensitivity to an antibiotic.	77.10%	12.90%	10%
K16	Indiscriminate and Injudicious use of antibiotics can lead to ineffective treatment.	78.10%	7.60%	14.30%
K17	Indiscriminate and Injudicious use of antibiotics can lead to exacerbation or prolongation of illness.	61.90%	13.30%	24.80%
K18	Indiscriminate and Injudicious use of antibiotics can lead to emergence of bacterial resistance.	67.60%	13.30%	19%
K19	Indiscriminate and Injudicious use of antibiotics can lead to additional burden of medical cost to the patient.	72.40%	10%	17.60%

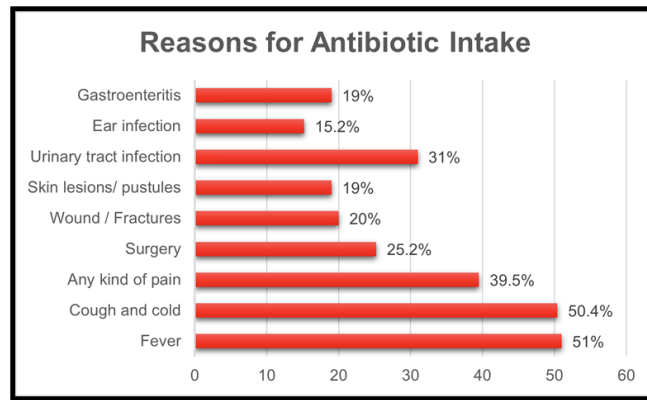
**Table 1:** Knowledge about Antimicrobials and Antimicrobial Resistance among Medical Students (N=210).

S.No	Questions	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
A1	Do you think antibiotic resistance is increasing?	46.20%	39.50%	12.40%	0.40%	1.50%
A2	Do you think we should be more concerned about antibiotic consumption ?	48.10%	37.60%	11%	1.50%	1.80%
A3	Awareness about antibiotic resistance is necessary.	54.80%	28.60%	13.30%	2.00%	1.30%
A4	Enough Knowledge should be generated to prevent antibiotic resistance.	50.50%	29.50%	17.10%	2.00%	0.90%
A5	Do you think physicians often prescribe antibiotics unnecessarily?	14.80%	27.60%	31.40%	20%	6.20%
A6	When I have a cold, I should take antibiotics to prevent getting a more serious illness.	18.60%	24.30%	28.10%	18.10%	11%
A7	When I get fever, antibiotics help me to get better quickly.	17.10%	34.80%	28.10%	13.80%	6.20%
A8	Whenever I take an antibiotic, I contribute to development of antibiotic resistance.	14.30%	25.20%	41.90%	12.90%	5.70%
A9	Skipping one or two doses dose not contribute to the development of antibiotic resistance.	17.10%	27.10%	31.90%	18.10%	5.70%
A10	Antibiotics are safe drugs, hence they can be commonly used.	18.60%	22.90%	31%	18.10%	9.50%
A11	Appropriate use of antibiotics can improve patient care and outcome.	43.30%	34.80%	7.60%	2.10%	2.20%
A12	Appropriate use of antibiotics can reduce problems of antibiotic resistance.	38.60%	37.10%	19%	0.65%	2.65%

**Table 2:** Attitude towards Antimicrobials and Antimicrobial Resistance among Medical Students (N=210).

S.No	Questions	Yes	No	Uncertain
P1	Have you taken any antibiotics within the last six months? If yes, did the antibiotic work successfully?	61.40%	31.90%	6.70%
P2	If no in the previous question, did you take another antibiotic?	21.90%	53.80%	24.30%
P3	Have you ever thought some antibiotics are not effective to yourself as before?	38.60%	40.50%	21%
P4	I educate patients on the use of antibiotics and resistance related issues.	77.10%	13,3%	9.50%
P5	Do you prefer to take antibiotic when you have cough and sore throat?	54.30%	31.90%	13.80%
P6	Do you keep leftover antibiotics for use in future?	36.70%	49%	14.30%
P7	Do you take antibiotics in a full completed course during your illness?	74.30%	17.60%	8.10%

**Table 3:** Practices on Antimicrobials and Antimicrobial Resistance among Medical Students (N=210).



**Figure 4:** Distribution of Reasons for Antibiotics Intake (N=210).

**Inference:** The Major reason for the participants to start on antibiotic therapy was due to fever and cough /cold (to treat URI symptoms).

S.No	Year of Study Participants	N (%)	Aware of AMR (n)	Unaware of AMR (n)
1	1st year Prof MBBS	13 (6.2)	10	3
2	2nd year Prof MBBS	14 (6.6)	12	2
3	3rd year Prof MBBS	126 (60)	119	7
4	4th year Prof MBBS	9 (4.3)	8	1
5	CRMI	48 (22.9)	46	2

**Table 4:** Represents the Categorical Distribution of Study Participants with Their Awareness Related to Antimicrobial Resistance (N=210).

**Inference:** Majority of the 3<sup>rd</sup> year MBBS students and CRMIs are well aware of Antimicrobial resistance caused due to injudicious usage of antibiotics than rest of batch of participants.

Variables	Aware of AMR N(%)	Unaware of AMR N(%)	p value(X <sup>2</sup> )
Male	73 (90.1)	8 (9.9)	0.139 ( 2.183)
Female	123 ( 95.3)	6 (4.7)	

**Table 5:** Represents the Association of Gender Wise Distribution of Study Participants with Their Awareness Related to Antimicrobial Resistance (N=210).

**Interpretation:** There is no significant difference in awareness of antimicrobial resistance in our study. association of gender among medical students regarding the

Term	Good		Adequate		Poor	
	n	%	n	%	n	%
n = 210						
Knowledge	63	30	133	63.3	14	6.7
Attitude	69	32.8	139	66.2	2	1
Practice	99	47.1	99	47.1	12	5.8

**Table 6:** Represents the Distribution of KAP among the Study Participants Related to Antimicrobial Resistance (N=210).

## Discussion

In a study done by Sannathimmappa MB, et al. [3] about 90% was aware of the antibiotic resistance and 75% knew that it can be used to treat bacterial resistance. But the students lacked knowledge about the consequences and factors contributing to the development of resistance similar to this study. In a study done by Wang Y, et al. [4] about 75.2% have performed incorrect antibiotic prescription which is similar to this study where only 50.5% felt the need for knowledge about antibiotic resistance. Thus these studies showed that the lacunae existing even among the medical students regarding the correct usage, prescription and adverse outcomes. A study done by Haque M, et al. [2] 65% (132) had used antibiotics in the last year of the study which showed that towards the internship the students get to know better about the concept of AMR. In a study done by Manoj et al, as compared to first year students, knowledge was significantly higher among students of all years. As much as 83.3% students have consumed antibiotics in previous year of survey. Around 45% of medical students accepted that they buy antibiotics without a medical prescription. In a study done by Zulu A, et al. [8] More than 85% of the respondents agreed that an indiscriminate and injudicious use of antibiotics could lead to an ineffective treatment, increased adverse effects, the emergence of bacterial resistance and an additional burden of medical costs to the patient. A majority 88% were aware that if antibiotics take too often, they are less likely to work in the future. A study by Sunusi LS, et al. [9] showed that 60.1% had average attitudes and the students socio demographic background has a greater influence on the knowledge and attitude domains. A study by Samersakar et al showed that healthy students are not very much knowledgeable when compared to students who have health concerns because they are in use of antibiotics frequently for health problems [10] Studies by Suaifan GA, et al. [11], Nambatya JL, et al. [12] showed that the students did not complete the full prescribed course of antibiotics which was in concordance with this study. A study by H Phagava H, et al. [13] showed that 60.38% consider the health education as significant tool in disseminating the knowledge regarding antibiotic resistance. A study by Jairoun A, et al. [14] showed the overall high knowledge about AMR among students. Studies by Khan et al and Virgin et al showed that students were not confident about prescribing antibiotics without taking advice from their seniors, showing that there is a lacuna in their knowledge about antibiotic prescription [15,16]. This study showed that there is a need for interventions like strict antibiotics policy, scheduled antibiotics sensitization program in medical education. A cross-sectional study by Panthi S, et al. [17] About 76.3% of the students believed that improper use of antibiotics/ self- prescription can cause and promote antibiotic resistance. 33.2% of the students thought that use of antibiotics will speed up recovery from flu and

cold and skipping one or two doses does not contribute to the development of antibiotic resistance. 93.3% of students have never attended a continuing medical education about rational use of antibiotics in the past. A cross-sectional study conducted by Asharani N et al. [18] 58% of the students were of the opinion that skipping one or two doses will not lead to antibiotic resistance and 68.4% of the participants felt that irrational use of antibiotic practices done at local level will not matter for the development of resistance globally. More than 90% of the students executed good practice toward antibiotic usage. A cross sectional study conducted by Virmani S, et al. [19] Medical (25%) & Dental (36%) students declared self-prescription as a frequent practice. b-lactam group was the most popular group of antibiotics, with over 44% vouching its use. There are many lacunae when the knowledge, attitude and practices were assessed among the medical students. So capacity building with tutorials and educating about the prescription practices by means of integration lectures to students will serve the purpose. Efforts must be taken to convert the theory based knowledge into practices based knowledge and this transition has to be imbued by the students from their earlier days of medical curriculum itself [20].

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