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UNDERSTANDING OF KNOWLEDGE, ATTITUDE AND PRACTICE ABOUT ANTIBIOTIC USE AMONG MEDICAL STUDENTS AND GENERAL PUBLIC

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ARTICLE INFO	ABSTRACT
Article history Received 10/08/2019 Available online 30/09/2019 **Keywords** Antibiotic, Bacteria, Knowledge, Attitude And Practice.	Antibiotics are among the most widely used class of drugs in hospitals, and they are really important to be used optimally otherwise emerging resistant pathogens will interfere with treatment outcomes. The study was conducted for a period of six months. An Institutional and community based cross-sectional and prospective study. Out of 135 participants, 66(48.9%) were males and 69(51.1%) were females. Analysis of knowledge about antibiotics and attitude towards it among age group (26-33) and (34-42) showed 50-50 results, indicating more awareness about antibiotic is necessary for this age group people. More number of participants were from pharmacy faculty which were 60 (44.4%). Students were participated in more number which was 105 (77.8%) . Survey on knowledge and attitude of participants based on gender, we found both more good knowledge(72.2%) as well as more positive attitude(63.6%) in male. Pharmacy students had more good knowledge (85%) and positive attitude (70%). Students had more good knowledge (68.6%) and positive attitude (57.1%). Age group of 18-25 years was found to have more good knowledge (76.7%) and positive attitude (70%) regarding antibiotics .The intended correct response to knowledge related questions was given correctly by students. Attitude towards usage of antibiotics is clearer among students of medical background. However, students show better attitude regarding antibiotic usage. Students and service people showed good understanding regarding antibiotic usages. Medical students showed better understanding, more good knowledge; as the mean value for each domain was slightly higher for medical background students.

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INTRODUCTION

Antibiotic, also called antibacterial, are a type of antimicrobials [1] drug used in the treatment and prevention of bacterial infections.[2]They may either kill or inhibit the growth of bacteria. A limited number of antibiotics also possesses antiprotozoal activity.[3, 4, 5] Antibiotics are not effective against viruses such as the common cold or influenza; drugs which inhibit viruses are termed antiviral drugs or antiviral rather than antibiotics. Some commonly used antibiotics are Penicillin, amoxicillin, azithromycin, cephalexin, erythromycin, clarithromycin, levofloxacin, ciprofloxacin etc. Diarrhea, mild stomach upset, vomiting, Allergic reaction, rashes etc. are the side effects of antibiotics.[6, 7]

Antibiotics revolutionized medicine in the 20th century. [8]Antibiotics are among the most widely used class of drugs in hospitals, and they are really important to be used optimally otherwise emerging resistant pathogens will interfere with treatment outcomes. However, their effectiveness and easy access have also led to their overuse promoting bacteria to develop resistance.[9] Resistance occurs when bacteria changes in response to the use of antibiotic medicines. It has been estimated that two-third of all patients receive at least one antibiotic during their hospitalization, and the cost involved is therefore correspondingly high and up to 40% of total hospital's drug expenditure may be devoted to the purchase of antibiotics.[10] Antibiotic use is viewed as a key driver for the increase and spread of antibiotic resistance and has implications for morbidity, mortality, and health care both in hospitals and in the community.[11] Antimicrobial resistance is an under-appreciated threat to public health in nations around the globe as it results in multiple resistant organisms leading to infections not easy to treat .[12] With globalization booming, it is important to understand international patterns of resistance. If countries already experience similar patterns of resistance, it may be too late to worry about international spread.[13]Antibiotic resistance is rising to dangerously high levels in all parts of the world. New resistance mechanisms are emerging and spreading globally, threatening our ability to treat common infectious diseases. These resistance mechanisms may be encoded on transferable genes, which facilitate the spread of resistance between bacterial strains of the same and/or different species. Other resistance mechanisms may be due to alterations in the chromosomal DNA which enables the bacteria to withstand the environment and multiply.[14] Antibiotics are an extremely important weapon in the fight against infections.[15]

Perhaps the most important public health problem of today is the rapid development and proliferation of antibiotic resistant bacteria. Indiscriminate use of these relatively easily produced compounds has led to crises in many areas. In many countries, antibiotics are widely available over the counter (OTC) with "black market" production. The improper use of antibiotics may arise from a complex interaction between numerous factors, such as prescribers' knowledge and experiences, diagnostic uncertainty, perceptions of patients in relation to the patient-prescriber interaction. Inappropriate use of antimicrobial drugs is closely related to the knowledge, attitude and behavior of the population, as well as the antibiotic prescribing behaviour and insufficient patient education provided by the healthcare professionals; all these contributing to the increase of antibiotic resistance.[16] Factors contributing to inappropriate prescribing practices have been elucidated. In particular, numerous studies of adults have shown those patients' expectations or physicians' perceptions of those expectations affect the physicians' prescribing behaviour.[17]Other factors included the lack of policies for restricting and auditing antibiotic prescriptions in many countries. [18] The main reasons of self-antibiotics practice in developing countries are over-the-counter availability, prescribing on demand, high cost of the hospitals or healthcare consultation and dissatisfaction with medical practitioners. A major deficit of self-medication is the lack of clinical assessment of the condition by a qualified medical professional, which could result in overlooked diagnosis and hindrances in appropriate treatments.[19] The chemotherapy of bacterial infections depends on the isolation of the aberrant agent, categorization of the agent's antibiotic susceptibility, and bringing the suitable antibiotic to the site of infection in adequate quantities to either kill the bacteria (bactericidal) or modify it to permit the body's immune response to eventually kill it.[20] The massive increases in trade and human mobility brought about by globalization have enabled the rapid spread of infectious agents, including those that are drug resistant.[21, 22]

Drug resistance consequences are increased hospital stay, cost, morbidity and mortality. Expansion of antibiotic resistance is accelerated by increased use of antibiotics and previous reports claim that >50% of antibiotics are sold or purchased without a valid prescription.[23, 24]

All these factors emphasize the need to investigate and tackle such unhealthy practices.[25]Though antibiotic resistance is an alarming problem, it has remained a low priority area in developing nations.[26]To meet the challenges which are posted by its spread, various approaches have been developed. One of the approaches is to undertake various institutional and educational programs among the public sector as well as among medical sector about antibiotic resistance, its complications and regarding the steps to prevent its development and spread.[27]Therefore, proper training and awareness should be provided to the undergraduate and post graduate students regarding the careful prescribing, manufacturing and the use of antibiotics.[28] This will help to promote the judicious use of antibiotics.[29]. Understanding patients' knowledge, attitude, and practices may facilitate more effective communication between the clinician and patient, as well as aid in the development of strategies to educate patients and the public.[30] .We should also promote a 'Do not recycle antibiotics' message towards the more highly educated, young women who are more likely to store, take and share antibiotics without advice.[31]The perceptions of general public on conditions requiring antibiotic therapy, channels of obtaining antibiotics, their compliance to the treatment as prescribed are fundamental to any efforts to control antibiotic use and resistance.[32] Our goal is to evaluate the understanding of knowledge, attitude and practice about antibiotic among students of medical background and general public.

MATERIALS AND METHODS
Study design:
This study was an Institutional and community based cross-sectional and prospective study conducted at RR Institutions and in general public over a period of 6 months (Oct 2017 to March 2018).

Study population:
The study was done at RR Institutions and in community, Bangalore. The data was collected on a self-developed questionnaire form consisting of knowledge, attitude and practice questions related to antimicrobials use.

Sampling method:
The study was conducted in R RInstitution, Bangalore among medical students and non- medical students who were present in the class during visit and also general public.

Study criteria
Inclusion criteria:
All the students of RR Institutions present in the class during visit in college and general public who were willing to participate.
Exclusion criteria:
Psychiatric patient, Children under 15 years of age were excluded from the study.

Study materials:
Data Collection Form:
Data was collected by using a self-designed questionnaire form consisting of knowledge, attitude and practice questions related to antimicrobials use. The questionnaire form was developed with reference from standard text book and research articles. The questionnaire form included socio-demographic details of the participants.

Ethical approval:
The study was approved by the Institutional Ethical Committee of R R college of pharmacy.

Data analysis:
The self designed questionnaire form included socio-demographic details of the participants. Knowledge about antimicrobial agents was assessed by using six questions, with the options true/false / uncertain. Attitude towards antimicrobial agents were evaluated by answering five questions, using scale strongly agree/ somewhat agree/undecided/somewhat disagree/ strongly disagree. Practice of antimicrobial agent was ascertained by using nine questions, with the option always/ usually/sometimes/never. Knowledge was assessed by giving 1 point to correct answer and 0 to incorrect answer. Score of > 4 was taken as good knowledge while score of < 4 termed as poor knowledge. Attitude was assessed by giving 1 to SA , 2 to A, 3 to D, and 4 to SD. Score of 3 or higher were taken as positive attitude while <3 as negative attitude. Practice based questions was divided into three categories namely irrational use of antibiotics, self antibiotic use and method of taking antibiotics and participants' response was analyzed by using Microsoft Excel.

RESULTS
Participant Distribution Based on Demographic Data:
This study included 135 participants from medical students, non-medical students and general public. The study was conducted from Oct 2017 to March 2018, at RR institutions and in community, Bangalore.

Distribution of gender in participants observed in this study:
Out of 135 participants, 66(48.9%) were males and 69(51.1%) were females which is represented in Table-1 and figure -1.

Table No.1: Gender Wise Distribution of Participants.

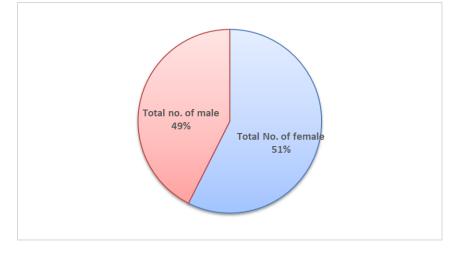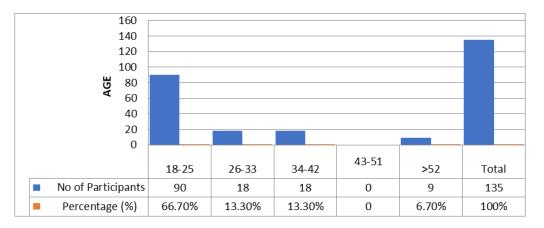| Gender	No of Participants	Percentage (%)
Male	66	48.9
Female	69	51.1
Total	135	100

Figure No.1: Pie chart of Participant Distribution Based on Gender.

Participant Distributions with Respect to Their Age Group:
Participants were categorized according to their age groups. Out of 135 participants majority 90 (66.7%) of them were found in the age group between 18-25 years, followed by 18 (13.3%) of each in the age group between 26-33 years and 34-42 years, then 9 (6.7%) were found in >52 years which is represented in table-2 and figure-2.

Table No.2: Participants Distribution with Respect to their Age Groups.

Age	No of Participants	Percentage (%)
18-25	90	66.7%
26-33	18	13.3%
34-42	18	13.3%
43-51	---	---
>52	9	6.7%
Total	135	100%

Figure No.2: Graphical Representation of Participants Based on Age Group.

Distribution of Participants Based on Course:
Out of 135 participants 60(44.4%) were from pharmacy, 30(22.2%) were nursing and 45(33.3%) were others which are represented in Table-3 and Figure-3.

Table No.3: Participants Distribution Based on Course.

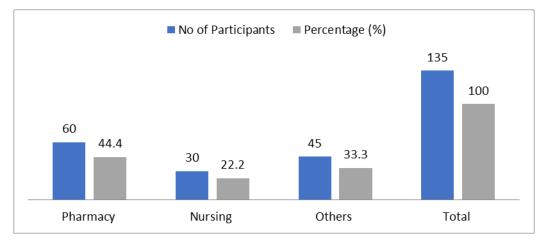| Course of students	No of Participants	Percentage (%)
Pharmacy	60	44.4
Nursing	30	22.2
Others	45	33.3
Total	135	100

Figure No.3: Graphical Representation of Participants based on Course.

Distribution of Participants Based on Occupation:
     Out of 135 participants 105(77.8%) were students, 27(20%) were from service and 3(2.2%) were others which are represented in Table-4 and Figure- 4.

Table No. 4: Participants Distribution Based on Occupation.

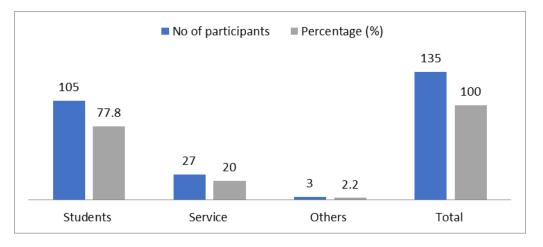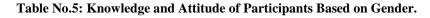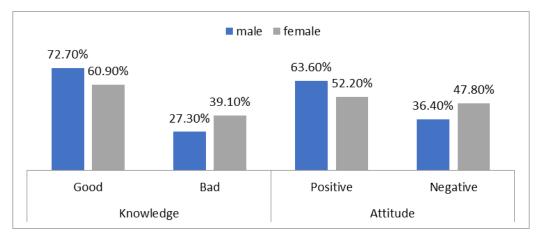| Occupation	No of participants	Percentage (%)
Students	105	77.8
Service	27	20
Others	3	2.2
Total	135	100

Figure No.4: Graphical Representation of Participants Based on Occupation.

Knowledge and Attitude of Participants Based on Gender:

Out of 135 participants included in this study, 66 (48.9%) participants were male and 69 (51.1%) participants were female. The number of female was comparatively high. When we compared response to knowledge and attitude towards antibiotic between male and female, we found more good knowledge in male (72.7%) as well as more positive attitude in male (63.6%) which is represented in Table-5 and figure -5.

Table No.5: Knowledge and Attitude of Participants Based on Gender.

Gender	Knowledge		Attitude	
	Good	Poor	positive	Negative
Male (66)	72.7% (48)	27.3% (18)	63.6% (42)	36.4% (24)
Female (69)	60.9% (42)	39.1% (27)	52.2% (36)	47.8% (33)

Figure No. 5: Graphical Representation of Knowledge and Attitude of Participants Based on Gender.

Knowledge and Attitude of Participants Based on Course:

In 135 participants enrolled, 60 were pharmacy students, 30 were nursing students and 45 were others. Among them Pharmacy students had more good knowledge (85%) and positive attitude (70%) towards antibiotics as compared to nursing and others which is represented in Table-6 and figure -6.

Table No.6: Knowledge and Attitude of Participants Based on Course.

Course distribution	Knowledge (%)		Attitude (%)	
	Good	Poor	Positive	Negative
Pharmacy	85	15	70	30
Nursing	60	40	60	40
Others	46.7	53.3	40	60

	Pharmacy	Nursing	Others
Knowledge (%) Good	85	60	46.7
Knowledge (%) Poor	15	40	53.3
Attitude (%) Positive	70	60	40
Attitude (%) Negative	30	40	60

Figure No. 6: Graphical Representation of Knowledge and Attitude of Participants Based on Course.

Knowledge and Attitude of Participants Based on Occupation:
        While analyzing 135 participants we found that, students had more good knowledge (68.6%) and positive attitude (57.1%) compared to service people and other groups. In comparison between service and others, service group was found to have more knowledge (66.7%) and attitude (66.7%) towards antibiotic use which is represented in Table-7 and figure -7.

Table No.7: Knowledge and Attitude of Participants Based on Occupation.

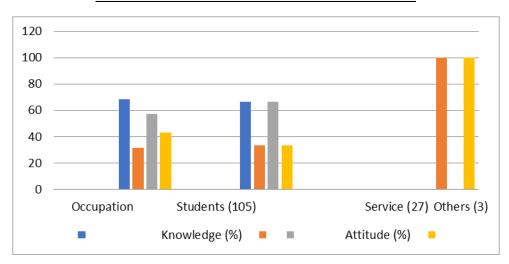| Occupation	Knowledge (%)		Attitude (%)	
	Good	Poor	Positive	Negative
Students (105)	68.6	31.4	57.1	42.9
Service (27)	66.7	33.3	66.7	33.3
Others (3)	---	100	---	100

Figure No.7: Graphical Representation of Knowledge and Attitude of Participants Based on Occupation.

Knowledge and Attitude of Participants Based on Age:
        Out of 135 participants included in the study, majority of participants belonged to age group of 18-25 years (90) followed by age group of 34-42 years (18), and age group of 26-33 years (18) and least number of participants in age group above 52 years (9). Among them, age group of 18-25 years was found to have more good knowledge (76.7%) and positive attitude (70%) regarding antibiotics which is represented in Table-8 and figure -8.

Table No.8: Knowledge and Attitude of Participants Based on Age.

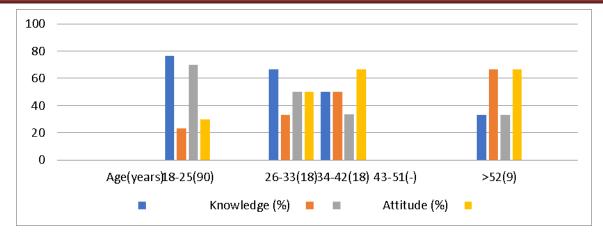| Age (Years)	Knowledge (%)		Attitude (%)	
	Good	Poor	Positive	Negative
18-25 (90)	76.7	23.3	70	30
26-33 (18)	66.7	33.3	50	50
34-42 (18)	50	50	33.33	66.7
43-51(-)	---	---	---	---
>52 (9)	33.3	66.7	33.3	66.7

Figure No. 8: Graphical Representation of Knowledge and Attitude of Participants Based on Age.

Distribution of Participants Based on Correct Response to Knowledge Questions:
    Out of 6 knowledge questions asked, students responded more correctly followed by others and house wife. 5th question was more correctly responded by students (60%) which is represented in Table-9 and figure -9.

Table No.9: Distribution of participants Based on Correct Response to knowledge Questions.

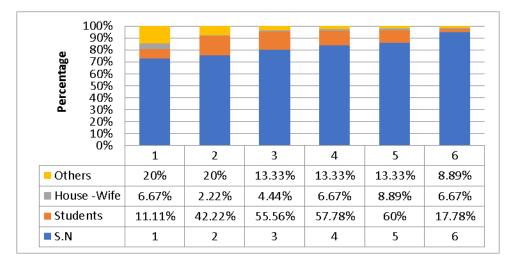| S. N	Questions	Students	House Wife	Others
1.	Antibiotics are drugs used to kill bacteria?	11.11%	6.67%	20%
2.	Bacteria cause common cold and influenza?	42.22%	2.22%	20%
3.	Antimicrobial resistance means if the drug is taken too often, it is less likely to work in future?	55.56%	4.44%	13.33%
4.	Indiscriminate antibiotic use without completion of course of treatment leads to resistance?	57.78%	6.67%	13.33%
5.	Antibiotic resistance is an important and serious global problem?	60%	8.89%	13.33%
6.	Newer and costly antibiotics are more effective?	17.78%	6.67%	8.89%

Figure No. 9: Graphical Representation of Correctly answered knowledge questions.

Distribution of Participants Based on Response to Attitude Questions (% Disagreed):
    Out of 5 attitude questions asked, students of medical background have more positive attitude than non-medical students which is represented in Table-10 and figure -10.
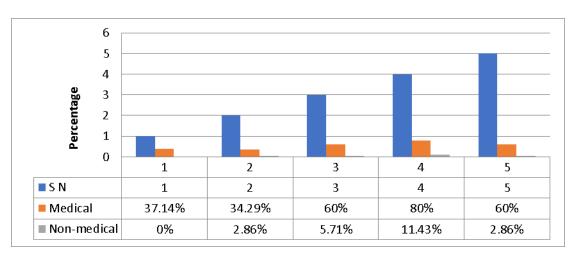
Table No.10: Distribution of participants Based on Response to Attitude Related Questions (% Disagreed).

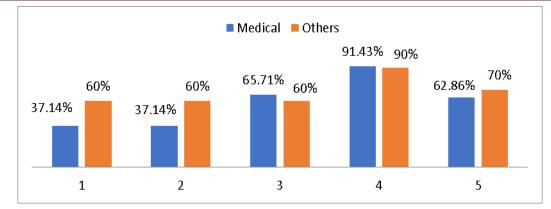| S N	Questions	Medical	Non-medical
1.	Antibiotics are safe drugs; hence they can be commonly used?	37.14%	0%
2.	Skipping one or two dosage doesn't contribute to the development of antibiotic resistance?	34.29%	2.86%
3.	Adverse effect of antimicrobials is reduced by using more than one antimicrobial at a time?	60%	5.71%
4.	Unwise use of antibiotics (Without prescription, left over drugs) will cure illness quickly?	80%	11.43%
5.	When you have cough and sore throat, antimicrobials are the first drugs of choice for early treatment?	60%	2.86%
*Percentages of disagree and strongly disagreed responses were combined.			
*P-value derived from Chi-square test.			
Note: Attitude was assessed by giving 1 to SA, 2 to A, 3 to D, and 4 to SD. Score of 3 or higher were taken as positive attitude while <3 as negative attitude.			

S N	1	2	3	4	5
Medical	37.14%	34.29%	60%	80%	60%
Non-medical	0%	2.86%	5.71%	11.43%	2.86%

Figure No. 10: Graphical Representation of Medical and Non-medical Students' attitude towards antibiotic use (% Disagreed).

Response to Attitude Related Questions Among Students and Others (% Disagreed):
Out of 5 attitude questions asked, students had more positive attitude as compared to others. 4th question was more correctly answered by students (91.43%) which is represented in Table-11 and figure -11.

Table No.11: Distribution of Response to attitude Related Questions Among Students and others.

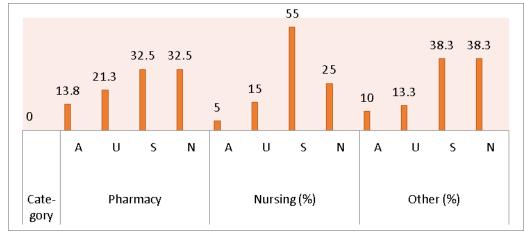| S N	Questions	Students	Others
1.	Antibiotics are safe drugs; hence they can be commonly used?	37.14%	60%
2.	Skipping one or two dosage doesn't contribute to the development of antibiotic resistance?	37.14%	60%
3.	Adverse effect of antimicrobials is reduced by using more than one antimicrobial at a time?	65.71%	60%
4.	Unwise use of antibiotics (Without prescription, left over drugs) will cure illness quickly?	91.43%	90%
5.	When you have cough and sore throat, antimicrobials are the first drugs of choice for early treatment?	62.86%	70%
*Percentages of disagree and strongly disagreed responses were combined.			
Note: Attitude was assessed by giving 1 to SA, 2 to A, 3 to D, and 4 to SD. Score of 3 or higher were taken as positive attitude while <3 as negative attitude.			

Figure No.11: Graphical Representation of Response to Attitude Related Questions Among Students and other groups who answered correctly.

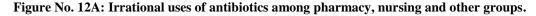**Practice Related Response Among Students and Other Groups:**
The response of the participants regarding practice related questions are listed in the Table-12 and figure -12A, 12B and 12C.

Table No.12: Distribution of participants based on practice related questions among students and other groups.

Category	Questions	Pharmacy (%)				Nursing (%)				Other groups (%)			
		A	U	S	N	A	U	S	N	A	U	S	N
Irrational use of antibiotics	Do you stop taking further treatment? Do you save the remaining antibiotic next time you get sick? Do you discard the remaining left-over medication? Do you give the left-over antibiotic to your friends/roommate if they get sick? Do you consult doctor before starting antibiotic?	13.8	21.3		32.5	32.5	15	55	25	10	13.3	38.3	38.3
						5							
Self-antibiotic use	Do you prefer to take antibiotic when you have cough and sore throat? Do you complete the full course of treatment?	45		12.5	27.5	15	25	20	55	0	36.7	33.3	13.3	16.7
Method of taking antibiotics	Do you check the expire date of the antibiotic before using? Do you insist doctor to prescribe antibiotic when you are sick?	55	11.7		18.3	15	23.3	20	30	6.7	44.4	20	13.3	22.2

*A- Always, U- Usually, S- Sometimes, N- Never

Figure No. 12A: Irrational uses of antibiotics among pharmacy, nursing and other groups.
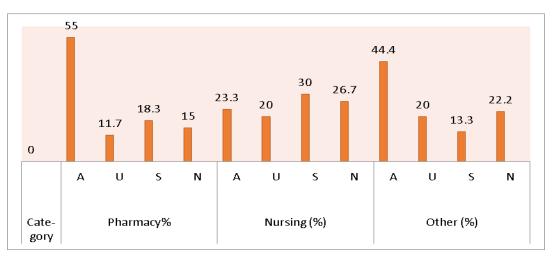

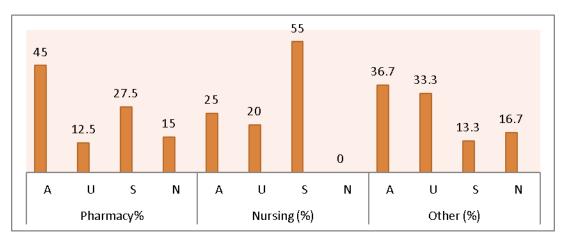**Figure No 12B: Method of taking antibiotics among pharmacy, nursing and other groups.**

Figure No.12C: Self antibiotic use among pharmacy, nursing and other groups.

Knowledge Score of The Participants Based on Demographic Characteristics:
    The mean ± SD scores of the population study regarding knowledge questions were evaluated and the details are mentioned in table-13.

DISCUSSION

This study aimed to assess the knowledge, attitude and practice related to antibiotic usage and antibiotic resistance among students and general public. The results of the study showed that medical students had better knowledge about antibiotic usage compared to non-medical background students and general public. There is a need for targeting case-based and outcome-based educational interventions towards non-medical background students and general public to improve their awareness about the actual prevalence of antibiotic resistance in the country, to enhance their understanding of the reason for failure of antibiotic therapy in non-adherent resistant patients, and to optimise antibiotic therapy. The clinical effectiveness and efficacy of antibiotics depends partially on their correct usage, on patients, physicians and retailers. Physician related factors are the fear of losing a patient's trust, the lack of correct information on indications of antibiotic usage and forced usage of antibiotics due to pressure from patients and families. Self-medication, sharing medication with other people, compliance of the patient and keeping part of the course for another occasion are the various patient factors.

In our study pharmacy students showed more positive attitude (70%) and good knowledge (85%) towards appropriate usage of antibiotics compared to nursing and others. When we compared response to knowledge and attitude towards antibiotic between male and female participants, we found more good knowledge in male (72.7%) and more positive attitude in female (60.9%). While analyzing the knowledge and attitude between service and others, service group was found to have more knowledge (66.7%) and positive attitude (66.7%) towards antibiotic use. Majority of the pharmacy students were of the opinion that an antibiotic course once started, should be completed (55%) compared to nursing (23.3%) and others (44.4%). Medical background students also avoided taking antibiotics if they had common cold (62.86%) versus non-medical background students and general public. In our study, out of 135 participants, majority of participants (66.67%) belonged to age group of 18-25 years followed by 13.34% belonged to age group of 34-42 years, 13.33% belonged to age group of 26-33 years and 6.66% belonged to age group above 52 years.

Among them participants of age group of 18-25 years were found to have more good knowledge (76.7%) and positive attitude (70%) regarding antibiotics. These findings indicate that medical background students were more aware about antibiotic use as compared to non-medical background students and general public. Wrong beliefs held by non-medical and general public may lead to inappropriate antibiotic usage and eventual development of antibiotic resistance.

The practice of antibiotic self-medication was higher in general public compared to the student group. Medical background students when asked about the reason associated with antibiotic resistance did significantly better on questions related to antibiotic prescribing and restrictions on antibiotic sales. Medical curriculum in India includes hospital rotations that might be one of the reasons that medical students have more experience with optimal antibiotic therapy. Medical students understood that using higher generation antibiotics for mild infection can cause antibiotic resistance. The result of knowledge studies showed that medical background students can get more information about antibiotics than other students or public. Our study results also prompt that the antibiotic knowledge and attitude education should be strengthened in India. Many students and general public believed that antibiotics can speed up recovery of common cold, cough and a number of other related illness arising from viral infections.

Today many countries like Britain and Holland are focusing on public education aimed at changing the irrational and indiscriminate use of antibiotics in the community in order to impose a restriction on the development of resistance to antibiotics. Whereas some researchers have reported that public education alone may not necessarily improve the tendency to misuse and abuse antibiotics in the society, other works argue that providing a clear guideline for medical practitioners may provide a quicker and more effective route to prudent and rational use of antibiotics eventually reversing the current trend.

This study is not without limitations. The conclusions were drawn from a convenience sample representing an institution and general public in South India. These findings might not be generalisable for rest of the students and general public all over India. However, this study provides a valuable insight about knowledge, attitude and practice about antibiotic usage and resistance among the students and general public. Following counselling points can be given when an antibiotic is prescribed as an awareness initiative.

Inform your physician of any allergies you have-such as a penicillin allergy- prior to receiving any antibiotics.
Be sure to take complete amount of antibiotic prescribed according to the physician's instructions.
Ask your pharmacist about potential side effects, and contact your physician immediately if any serious reactions occur.
If you miss a dose, do not double the next dose. Simply resume with the next schedule dose as directed.
Because some foods and alcohol may interact badly with antibiotics, discuss with your pharmacist whether you should take antibiotics on an empty or full stomach.
Make sure that antibiotics are stored properly. Although most may be stored at room temperature in a dry place, some require refrigeration.

- Never insist your doctor to prescribe an antibiotic for you.
- Never take antibiotics for viral infections.
- Never take antibiotics that were prescribed for someone else.
- Never take antibiotics that were left over from a previous infection.
- If antibiotics are prescribed for you, finish them even if you feel better.

CONCLUSION

In this study, students of age group (18-25 years) with medical background had better knowledge about antibiotics and its usage than non-medical background students.

Similarly, studies done according to, Gender wise- male had good knowledge and positive attitude than female. Course wise- pharmacy students showed better knowledge than nursing and others. Occupation wise- students were better than service. Awareness about antibiotic usage should be created at large to reach all levels of population. Research can also be extended to see the predictors and outcomes of polypharmacy in psychiatric OPD.

ACKNOWLEDGEMENTS

Conflict of Interests

No Interest.

List of Abbreviations used.

Abbreviations	Name of abbreviations
WHO	World Health Organization
SD	Standard Deviation
KAP	Knowledge, Attitude and Practice
OTC	Over the counter
DNA	Deoxyribonucleic Acid

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