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Awareness regarding antibiotic use and resistance among medical students: Institutional based cross-sectional survey.

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Abstract:
Background*: Antibiotics are defined as medicines used to prevent and treat bacterial infections. Misuse of antibiotics can lead to Antibiotic resistance which is a major threat to public health globally. It occurs when bacteria change in response to the use of these medicines.*
Materials and Methods*: A cross-sectional study was conducted in Government Medical college of Saharanpur, U.P. for a period of two months among MBBS Students from first year to final year and interns. All those who were willing to participate and present at the time of survey were included. Purposive sampling technique was used. Pretested, semi structured questionnaire was used to collect information. Data was collected and appropriate statistical tests were applied.*
Results*: A total of 442 MBBS students and interns were included in the study. knowledge, attitude and practice of students regarding antibiotic use and resistance was quite satisfactory. Post-hoc analysis revealed a significant relationship between the year of study and attitude towards antibiotic resistance, with interns (2018) and 3rd year (2021) showing significantly better attitudes whereas knowledge and practice showed non-significant results.*
Key Word*: Knowledge, Attitude, Practice, Antibiotic, Resistance, Medical students.*

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I. Introduction

Antibiotics are questionably the oldest and most used medicine of all time by mankind across the globe. By definition Antibiotics are medicines used to prevent and treat bacterial infections.[1] The discovery of antibacterial property in Penicillium rubens by Alexander Fleming was the beginning of modern day antibiotics.[2] Till date antibiotics have been like a boon having saved life of countless patients and improved patient care via preventive or curative therapy.[3] World Health Organization (WHO) report on surveillance of antibiotic consumption stated that overall consumption ranged from 4.4 to 64.4 defined daily doses (DDD) per 1,000 inhabitants per day.[4]

Unfortunately, due to long term and unjustified use of antibiotics we are at threat of antibiotic resistance. WHO recognizes that "Antibiotic resistance is one of the biggest threats to global health, food security, and development today."[1] It is a naturally occurring process due to evolutionary changes in bacteria in response to the use of these medicines but irrational use has accelerated the process. The Bacteria that become antibiotic-resistant are far more dangerous than non-resistant bacteria as they are harder to kill and thus leading to long term hospital stays much costly treatment and increased mortality. Ten million people are predicted to die globally each year due to antibiotic resistance and it will cost the global economy US$100 trillion by 2050.[5] WHO divided antibiotics in three categories - "access", "watch," and "reserve". This list aimed to function as a helping guide for physicians on when to use these drugs.[6]

In developing countries the situation of antibiotic resistance worsens due to the following reasons- self-medication, medication without prescription, high cost of medical consultations, dissatisfaction with medical practitioners, inadequate regulation of antibiotics and over-the counter sales of antibiotics.[7,8] An alarming increase in resistance strain of Escherichia coli (84%), Klebsiella (69%), Pseudomonas aeruginosa (34%), and

Staphylococcus aureus (85%) was reported in 2017 in India putting us at very high risk and a need to deal with the situation before it gets out of hand.[9] Studies show that while many medical students have a good understanding of the concept of antibiotic resistance, there are still significant gaps in their knowledge regarding appropriate antibiotic use.[10] A study in India suggests that there is a need to improve medical education regarding Anti-Microbial Resistance (AMR), awareness of infection & control policies and antimicrobial stewardship program in clinical settings.[11] Another study in central India concluded that although medical student's knowledge in terms of antibiotic resistance was quite satisfactory but a significant improvement is needed in terms of attitude and practises.[12]

This study will help us to find the magnitude of the problems due to antibiotic resistance thereby helping us to guide our future generation doctors to wisely develop protocols for the use of antibiotics. As a result, this study was planned with objective to find the level of knowledge, attitude and practice of antibiotic use among medical students.

Objectives:

1. To find the level of knowledge and practices of antibiotic resistance.
2. To assess the knowledge, attitude, and practices of antibiotic resistance among undergraduate medical students in Government Medical college, Saharanpur, Uttar Pradesh (U.P.).

II. Material And Methods

A cross-sectional study was conducted for a period of three months among MBBS Students (first to final year) and interns of Shaikh-Ul-Hind Maulana Mahmood Hasan Medical College, Saharanpur, UP. All those who were willing to participate in the study and were present at the time of survey were included in the study. Pretested, self-administered questionnaire was used to collect information on sociodemographic profile, antibiotic use and resistance.

Study Design: A cross-sectional study.

Study Location: This was a tertiary care teaching hospital-based study done in Department of Community Medicine, Shaikh-Ul-Hind Maulana Mahmood Hasan Medical College, Saharanpur, Uttar Pradesh.

Study Duration: August 2024 to October 2024.

Sample size: 442 patients.

Subjects & selection method: The study population was MBBS Students (first to final year) and interns of Shaikh-Ul-Hind Maulana Mahmood Hasan Medical College, Saharanpur, UP. Purposive type of sampling method was used and all students were invited to participate in the study.

Inclusion criteria:

1. All those who were willing to participate in the study.
2. Students who gave informed consent to participate.

Exclusion criteria:

1. Students who were absent at the time of study.
2. Students who submitted incomplete or invalid questionnaires.

Procedure methodology

After framing the questionnaire and obtaining ethical clearance from Institutional Ethical Committee the data was collected. After explaining the purpose of study, consent was taken and students were asked to fill the questionnaire to the best of their knowledge without any outside resources and submit their responses. Participation was voluntary and confidential.

Study tool was questionnaire consisting of two parts:

Section A: Questions on socio-demography: It included batch of students, age and gender.

Section B: Questions on knowledge, attitude and practice of antibiotic use and resistance:

It consisted of 15 questions out of which 5 questions assessed Knowledge, 5 attitude and 5 practice of study participants. All questions were asked on response YES/NO.

Statistical analysis

The data collected was entered into the excel sheet, coding and cleaning of data was done and analyzed using SPSS (version 20.0). Categorical variables were summarized using frequency and percentage. Quantitative variables were summarized using median and interquartile range (IQR). Pearson's chi-square test or Fisher's exact and one way ANOVA tests were used to determine the relationship between factors related to KAP as predictors. Post hoc test was applied within each year MBBS students on knowledge, attitude, practice score. $p < 0.05$ was considered statistically significant.

III. Result

Table 1 shows that out of 442 study participants almost equal number were from each batch. Majority of participants were males (50.5 %) and maximum number belonged to age group 21-25 years (76.0%).

Table no 1 : Socio- demographic profile of the study participants (n=442):

Parameters	Variables	Frequency (n)	Percentage (%)
Batch wise distribution of students	First year	101	22.9
	Second year	86	19.5
	Third year	96	21.7
	Fourth year	77	17.4
	Interns	82	18.6
Gender	Male	223	50.5
	Female	219	49.5

In Table 2 knowledge, attitude and practice of students regarding antibiotic use and resistance was quite satisfactory. Only for few factors such as use of higher level of antibiotic for mild infections increases the risk of antibiotic resistance and taking medication for prescribed duration, the level of knowledge and practice was unsatisfactory.

Table no 2: Distribution of study participants according to knowledge, attitude and practice of antibiotic use and resistance (n=442):

A.	**Knowledge related questions**	**N**	**%**
1	Improper use of antibiotics can cause antibiotic resistance	387	87.6
2	Antibiotic resistance is only a problem for people who take antibiotic	334	75.6
3	Bacteria which are resistant to antibiotics can spread from person to person	312	70.6
4	Animal husbandry is a source of antibiotic resistance	300	67.9
5	The use of higher level of antibiotic for mild infections may increase the risk of antibiotic resistance	58	13.1
B.	**Attitude related questions**	**N**	**%**
1	Parents should make sure all of their children's vaccinations are up to date	410	92.8
2	People should use antibiotics only when they are prescribed by a doctor or nurse	404	91.4
3	Doctors should only prescribe antibiotics when they are needed	403	91.2
4	Self- medication is a common cause for antibiotic resistance	398	90.0
5	Antibiotics are safe drugs hence can be used commonly	313	70.8
C.	**Practice related questions**	**N**	**%**
1	Antibiotics were not purchased as an over-the-counter drug	365	82.6
2	Advice was taken from health personnel regarding consumption of antibiotic	298	67.4
3	Antibiotics were consumed after consulting a physician	249	56.3
4	Antibiotics are taken for the prescribed duration once started	130	29.4
5	The leftover antibiotics are used at a later occasion to treat same disease	00	0.0

Table 3: depicts that comparison of knowledge, attitude and practice scores of study participants was done. After applying one way ANOVA test attitude scores were found to be statistically significant.

Table no 3: Scoring of knowledge, attitude and practice of study participants (n=442):

	Sum of squares	**F**	**Sig.**
Knowledge score	10.718	2.215	0.067
Practice score	6.624	0.974	0.421
Attitude score	152.35	4.676	**0.001**

Table 4: shows that Comparison of scores of knowledges, attitude and practice was done with the gender of study participants. On applying t test knowledge score was found to be statistically significant.

Table no 4: Comparison of scores of knowledge, attitude and practice with gender among the study participants (n=442):

	N	Knowledge score		Practice score		Attitude score	
		Mean + SD	**T & p**	**Mean + SD**	**T & p**	**Mean + SD**	**T & p**
Male	223	3.183 +1.207	**9.065**	2.260 +1.333	1.399&	22.094 + 2.876	0.743&
Female	219	3.109+ 0.993	**& 0.003**	2.456 + 1.267	0.238	22.867 + 2.880	0.389

Table 5: depicts Post hoc analysis within each year MBBS students on knowledge, attitude, practice score. 2018 batch has better attitude score than 2021 batch with significant P value (0.000), 2020 batch has better attitude score than 2021 batch with significant P value (0.046). The study shows that interns (2018) and 3rd year (2021) better attitude towards antibiotic resistance compared to 2nd year (2021). On assessing relationship between the year of study and level of knowledge and practices the results came out to be non-significant.

Table no 5: Post hoc analysis within each year of students on knowledge, attitude and practice scores (n=442):

		N	Knowledge score		Practise score		Attitude score	
			Mean + SE	**P value**	**Mean + SE**	**P value**	**Mean + SE**	**P value**
2018	2019	101	0.018 + 0.174	1.000	0.146 + 0.206	0.954	0.758 + 0.452	0.451
	2020		0.264 + 0.165	0.497	0.380 + 0.196	0.298	0.702 + 0.429	0.475
	2021		0.421 + 0.169	0.096	0.164 + 0.201	0.925	**1.875 + 0.440**	**0.000**
	2022		0.119 + 0.163	0.950	0.170 + 0.193	0.905	0.831 + 0.424	0.287
2019	2018	86	-0.018 + 0.174	1.000	-0.146 + 0.206	0.954	-0.758 + 0.452	0.451
	2020		0.246 + 0.168	0.585	0.233 + 0.199	0.769	-0.056 + 0.436	1.000
	2021		0.403 + 0.172	0.135	0.017 + 0.204	1.000	1.116 + 0.447	0.094
	2022		0.100 + 0.166	0.974	0.023 + 0.197	1.000	0.073 + 0.431	1.000
2020	2018	96	-0.264 + 0.165	0.497	-0.380 + 0.196	0.298	-0.702 + 0.429	0.475
	2019		-0.246 + 0.168	0.585	-0.233 + 0.199	0.769	-0.056 + 0.436	1.000
	2021		0.156 + 0.163	0.873	-0.215 + 0.193	0.799	**1.172 + 0.423**	**0.046**
	2022		-0.145 + 0.156	0.885	-0.210 + 0.185	0.790	0.129 + 0.406	0.998
2021	2018	77	-0.421 + 0.169	0.096	-0.164 + 0.201	0.925	**-1.875 + 0.440**	**0.000**
	2019		-0.403 + 0.172	0.135	-0.017 + 0.204	1.000	-1.116 + 0.447	0.094
	2020		-0.156 + 0.163	0.873	0.215 + 0.193	0.799	**-1.172 + 0.423**	**0.046**
	2022		-0.302 + 0.161	0.332	0.005 + 0.191	1.000	-1.043 + 0.418	0.094
2022	2018	82	-0.119 + 0.163	0.950	-0.170 + 0.193	0.905	-0.831 + 0.424	0.287
	2019		-0.100 + 0.166	0.974	-0.023 + 0.197	1.000	-0.073 + 0.431	1.000
	2020		0.145 + 0.156	0.885	0.210 + 0.185	0.790	-0.129 + 0.406	0.998
	2021		0.302 + 0.161	0.332	-0.005 + 0.191	1.000	1.043 + 0.418	0.094

IV. Discussion

Present study was conducted among medical students (both undergraduates and interns) of Government Medical College of Saharanpur with an aim to explore knowledge, attitude, and practices of students regarding antibiotic use and resistance.

The present study found out that 56.3% of antibiotics were consumed after consulting a physician or doctor. Similar finding was shown by Panthi et al (2020)13 (52.6 %) while findings lower than the present study was shown by Gupta et al. (2017)14 and Padmanabha et al. (2016)15 being 17.42% and 39.86% respectively. Much higher findings were shown by Chaurasia et al. (2020)16, Asharani et al. (2020)17 and Khan et al. (2013)18 being 95%, 91.6% and 92.8%. However, in Gupta et al. (2019)19 53.2% started antibiotic therapy without proper

consultation. Advice was taken from health personnel regarding consumption of antibiotic by 67.4% in this study whereas 65.3% bought antibiotics without doctor's prescription in Thomas et al. (2023)20, 43.18% in Gupta et al. (2017)14, 45.4% in Gupta et al. (2019).19 In our study antibiotics were not purchased as an over-the-counter drug by 82.6%. In this study 29.4% of participants much lower compared to 92.5% in Panthi et al. (2020)13 completed the full course as prescribed by doctor. In Gupta et al. (2019)19 27.6%, 17.42% in Gupta et al. (2017)14 21.6% in Khan et al. (2013)18, 11.7% in Yashin et al. (2018)21 around 5% Chaurasia et al. (2020)16 of the participants stopped taking antibiotic after feeling better. The leftover antibiotics are used at a later occasion to treat same disease there were zero participants in our study lower in some studies 10.14% in Gupta et al. (2019)19, 10.14% in Padmanabha et al. (2016)15, 17.6% in Yashin et al. (2018)21, 15.5% in Khan et al. (2013)18, 17.42 % in Gupta et al. (2017)14 also some studies had higher participants 40% in Chaurasia et al. (2020)16, 49.4 % in Panthi et al. (2020)13, 80.0% in Thomas et al. (2023)20, 73.3% Asharani et al. (2020)17 who kept the leftover medicines. Knowledge related questions improper use of antibiotic can cause antibiotic resistance 87.6% of the students agreed with the statement. In Gupta et al. (2019)19 93%, 84.06 % in Padmanabha et al. (2016)15, 84.1% in Ritchie et al. (2020)8, 76.3% in Panthi et al. (2020)13 while in Zulu A et al. (2020)22 it was lower at 27.3%, in Yashin et al. (2018)21 50.9% of participants believed misuse of antibiotics causes loss of effectiveness of an antibiotic to a specific pathogen. Chaurasia et al. (2020)16 82%, Thomas et al. (2023)20 53.3%, 93.5% Asharani et al. (2020)17 said antibiotic resistance is caused by unnecessary use of antibiotics. 67.9% of the participants in this study believe animal husbandry is a source of antibiotic resistance on contrary to just 17% in Panthi et al. (2020)13. Around 40% in Chaurasia et al. (2020)16 believed consumption of antibiotics treated animal products reduce antibiotic effectiveness. Asharani et al. (2020)17 31.6% agreed that antibiotic resistance can spread from animals to humans. Attitude related questions 42.8% in our study strongly agree that Antibiotics are safe drugs hence can be used commonly similar to 44.7% in Yashin et al. (2018)21, 56.9% in Asharani et al. (2020)17 but less in Gupta et al. (2017)14 around 24.24% and 26.5% in Dudhe et al. (2023)23 while only 4.35% in Padmanabha et al. (2016)15 and 2.4 % in Panthi et al. (2020).13 This study 67.2% strongly agreed that Self- medication is a common cause for antibiotic resistance in Asharani et al. (2020)17 84.7%, 30% in Panthi et al. (2020).13 In our study Internship batch has better attitude score than 2nd year batch with significant P value (0.000), 3rd year batch has better attitude score than 2nd year batch with significant P value (0.046) Knowledge score was significant in the participants but practise score and attitude score were not significant. In Gupta et al. (2019)19 comparison of mean score of knowledge when compared to first year with second year, third year, fourth year and internship was found to be significant. Second year compared to third year was significant. Third year compared to fourth year and internship was found to be significant.

V. Conclusion

According to the observations made in this study, knowledge, attitude and practice levels among students was quite satisfactory with maximum parameters reporting results more than 50%. The results indicate the need to update educational programs and introduce specific initiatives, especially for medical students, to improve their understanding of antibiotics. Education that emphasizes practical skills and behavioural changes, along with antimicrobial stewardship and focused actions, is crucial for upcoming prescribers. Additional research involving larger groups is necessary to apply these practices more broadly throughout the healthcare sector.

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