QUESTIONNAIRE BASED ASSESSMENT ON KNOWLEDGE AND ATTITUDE TOWARDS ANTIMICROBIAL RESISTANCE & ANTIMICROBIAL STEWARDSHIP PROGRAM AMONG SECOND YEAR MEDICAL UNDERGRADUATES OF TERTIARY CARE TEACHING HOSPITAL, KANPUR

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ABSTRACT **Objective** -To assess the knowledge and attitude of second year medical undergraduates towards antimicrobial resistance (AMR) and antimicrobial stewardship program (ASP)
Method –A cross-sectional questionnaire based study conducted among second year medical undergraduates of GSVM, Medical College, Kanpur in the form of pre-test and after sensitizing the students about AMR and ASP, again same questionnaire were given as post-test. Five Point likert scale has been used for assessment. Chi-square test was used and p-value <0.05 was consider statistically significant.
Result- Total of 239 students, 234 students participated in pre-test and 232 participated in post-test. Percentage of male students in pre & post-test were more (63.2% and 62.5%) compared to female students (36.8% and 37.5%).We have found highly significant (p<0.000001) improvement in knowledge and attitude towards AR and ASP at the end of post-test. Except for one question where almost equal percentage of students in both pre (68.4%) and post-test (69%) said they have never heard of ASP before the lecture taken.
Conclusion- Significant improvement in knowledge and positive attitude towards AMR and ASP has been found. Different methods of educational interventions (case problem study, practical session, and training) can be embedded for successful outcome.

KEYWORDS : Antimicrobial Resistance, Antimicrobial Stewardship Program, medical undergraduates

INTRODUCTION-
To improve is to change; to be perfect is to change often…*Winston Churchill*
The purpose of Competency-based education is to make medical student more skilled and enrich their knowledge by providing education and training especially on the topics which were given less significance.[1] Previously antimicrobial topic has been covered like any other topic since decades. Emphasising on importance of Antimicrobial Resistance (AMR) and Antimicrobial Stewardship Program (ASP) was not up to the mark. But since the implementation of CBME, every topic has got new view, as to where we need to focus has been highlighted. Antimicrobial resistance has always been a major concern in medical field with shortage of discovery of antibiotics and their continuous irrational use especially in developing countries like India.[2] This lead to enforcement of ASP. It is a multidisciplinary intervention to promote appropriate use of antibiotics as well as restricting its irrational use thereby optimizing the prescription in order to get best outcomes with minimal adverse events.[3] Education is the mainstay of these programs, and is necessary so as to reduce the damage caused by illegimate use of antibiotics.[4] Awareness among medical fraternity regarding ASP should be encouraged. Starting from undergraduate level will not only increase knowledge but also improve future antibiotic prescription. Preparing next generation medical graduates is an important task for better medical future. We need to understand the concept behind teaching and learning. Method of teaching has been evolved, it has become more learner centred rather than subject and time centred. Feedback always encourage the better and healthy modifications in the system. So assessing knowledge and attitude of students towards AMR and ASP will guide us to how much more do we need to work on the upliftment towards these topics.

MATERIAL AND METHODS-
This is a Cross sectional study. It was conducted by Department of Pharmacology, GSVM Medical College, Kanpur. A questionnaire based survey assessing the knowledge and attitude of 2nd year medical undergraduates towards antimicrobial resistance and antimicrobial stewardship programme. A self-designed structured questionnaire has been prepared consist of 20 questions using 5-point likert scale on Google form and each participant was explained the objective of the study .Consent was taken from the students. Link of the questionnaire has been shared. Firstly the questionnaire were administered as pre-test. The pre-test defined the baseline knowledge and attitude of students regarding antimicrobial resistance and ASP. After sensitizing the students by taking lecture on AMR and ASP. Same pre-test questions were administered in the form of post-test. Student were

given 45 min to give the response. Data were reported as frequencies and percentage. For comparison between pre and post-test, chi-square test has been used. p-value <0.05 was considered as significant.

RESULT
Out of total 239 students 234 students participated in pre-test and 232 students participated in post-test. Total female participants in pre and post-test were 36.8% and 37.5% respectively. While male participants were 63.2% and 62.5% in pre and post-test respectively. Most of students belongs to age between 19-22 years in both pre (85.5%) and post-test (85.8%).To the question whether they have taken antibiotics in the past, almost equal number of students in both pre(98.3%) and post-test(99.6%) said yes.

Demographic details, assessment of student's knowledge and attitude towards antimicrobial resistance and antimicrobial stewardship program in both pre-test and post-test has been shown in Table 1, Table 2 and Table 3.

Demographic details
Table 1

Variables	Characteristics	Pre-test (n=234) Frequency (%)	Post-test(n=232) Frequency (%)	χ^2	p-value
Gender	Female	86 (36.8)	87 (37.5)	0.92	>0.05
	Male	148 (63.2)	145 (62.5)		
Age (in years)	19-23	200 (85.5)	199 (85.8)	1	>0.05
	24-27	34 (14.5)	33 (14.2)		
Q1.Have you ever received antibiotic in the past	Yes	230 (98.3)	231 (99.6)	0.37	>0.05
	NO	4 (1.7)	1 (0.4)		

Table 2

Knowledge assessment questionnaire								
Q2.Antimicrobial resistance is a Nationwide Public Health Problem								
		SA	A	NS	D	SD	χ^2	p-value
Pre-test(n=234)	Frequency(%)	80 (34.1)	134 (57.3)	15 (6.4)	3 (1.3)	2 (0.9)	59.06	<0.000001
Post-test(n=232)		159 (68.5)	69 (29.7)	2 (0.9)	2 (0.9)	0 (0)		

Q3.Antimicrobial resistance is a Worldwide Public Health Problem

Pre-test(n=234)	Frequency (%)	77 (32.9)	123 (52.5)	30 (12.8)	2 (0.9)	2 (0.9)	60.18	<0.000001
Post-test(n=232)		151 (65.1)	78 (33.6)	3 (1.3)	0(0)	0 (0)		

Q4.Self -administration of antibiotics is one of the main cause of antibiotic resistance

Pre-test(n=234)	Frequency (%)	94 (40.2)	119 (55.1)	8 (2.1)	11 (1.7)	2 (0.9)	15.41	<0.00398
Post-test(n=232)		114(49.1)	109 (47)	9 (3.9)	0 (0)	0 (0)		

Q5.I have heard of the term ANTIMICROBIAL STEWARDSHIP PROGRAMME (ASP) before the class lecture on this topic
A. Yes
B. No

Pre-test(n=234)	Frequency (%)	A-74 (31.6)	B-160 (68.4)	-	-	-	0.018	=0.89
Post-test(n=232)		A-72(31)	B-160 (69)	-	-	-		

Q6. if yes, source
A. Newspaper
B.TV
C. Internet
D. Article
E others(seniors, friend, family member)

Pre-test(n=234)	Frequency (%)	A-4 (5.4)	B-0 (0)	C-52 (70.3)	D-0 (0)	E-18 (24.3)	0.25	=0.88
Post-test(n=232)		A-4 (5.6)	B-0 (0)	C-53 (73.6)	D-0 (0)	E-15 (20.8)		

Q7. Antimicrobial stewardship program is mainly done to control the emergence of antimicrobial resistance

		SA	A	NS	D	SD	χ^2	p-value
Pre-test(n=234)	Frequency (%)	38 (16.2)	93 (39.7)	85 (36.3)	15 (6.4)	3 (1.3)	143.5	<0.000001
Post-test(n=232)		135 (58.1)	92 (39.7)	5 (2.2)	0 (0)	0 (0)		

Q8.Antimicrobial stewardship programme is a tool to optimize antimicrobial prescription and not just supervision of antimicrobial resistance

Pre-test(n=234)	Frequency (%)	47 (20.1)	94 (40.2)	82 (35)	8 (3.4)	3 (1.3)	123.5	<0.000001
Post-test(n=232)		130 (56.0)	99 (42.7)	3 (1.3)	0 (0)	0 (0)		

Q9.Which of the following in NOT a goal of Antimicrobial stewardship programme
A. To choose the most appropriate antimicrobial agent for the patient
B. Understanding the benefits of antibiotic stewardship programme
C. Preventing overuse, misuse and abuse of antimicrobial agent
D. Minimizing antimicrobial resistance
E. None of the above

Pre-test(n=234)	Frequency (%)	A-7 (3)	B- 44 (18.8)	C-15 (6.4)	D- 19 (8.1)	E-149 (63.7)	159.8	<0.000001
Post-test(n=232)		A-3 (1.3)	B- 179 (77.2)	C-4 (1.7)	D-3 (1.3)	E-43 (18.5)		

Q10.De-escalation in antimicrobial stewardship programme means
A. Infectious disease management
B. Antibiotic prescribing behaviour
C. To a more targeted therapy(like from broad spectrum to narrow spectrum if required after culture sensitivity test)

Pre-test(n=234)	Frequency (%)	A-55 (23.5)	B-85 (36.3)	C-94 (40.2)	-	-	135.6	<0.000001
Post-test(n=232)		A-7 (3)	B-13 (5.6)	C-212 (91.4)	-	-		

Q11.We have Antimicrobial stewardship committee in our hospital
A. Yes
B. No
C. Not sure

Pre-tes(n=234)	Frequency (%)	A-55 (23.5)	B-11 (4.7)	C-168 (71.8)	-	-	44.81	<0.000001
Post-test(232)		A-6 (2.6)	B-158 (68.1)	C-68 (29.3)	-	-		

SA-Strongly agree, A-Agree, NS –not sure, D-disagree, SD-strongly disagree

Table -3

Attitude assessment questionnaire

Q12.I feel that this is the right time to implement antimicrobial stewardship programme in every hospital in India

		SA	A	NS	D	SD	χ^2	p-value
Pre-test (n=234)	Frequency (%)	11 (4.7)	94 (40.2)	120 (51.3)	6(2.5)	3 (1.3)	287.6	<0.0000001
Post-test (n=232)		183 (78.9)	45 (19.4)	3 (1.3)	1 (0.4)	0 (0)		

Q13.I feel that patient would be benefitted after having antimicrobial stewardship programme in hospitals

Pre-test (n=234)	Frequency (%)	30 (12.8)	92 (39.3)	105 (44.9)	6 (2.6)	1 (0.4)	287.6	<0.0000001
Post-test (n=232)		171 (73.7)	56 (24.1)	3 (1.3)	2 (0.9)	0 (0)		

Q14. I feel that ASP increase/would increase my knowledge of appropriate antimicrobial use

Pre-test (n=234)	Frequency (%)	129 (55.1)	90 (38.5)	11 (4.7)	4 (1.7)	0 (0)	15.3	=0.0004
Post-test (n=232)		159 (68.5)	71 (30.6)	1 (0.4)	1 (0.4)	0 (0)		

Q15.I feel that while visiting a hospital during clinical posting, auditing the prescription for antibiotics would be an efficient use of my time

Pre-test (n=234)	Frequency (%)	18 (7.7)	98 (41.9)	106 (45.3)	11 (4.7)	1 (0.4)	119.6	<0.0000001
Post-test (n=232)		94 (40.5)	115 (49.6)	17 (7.3)	5 (2.2)	1 (0.4)		

Q16. I feel that ASP guidelines and committee are more an obstacles than a help to clinical care

Pre-test (n=234)	Frequency (%)	12 (5.1)	35 (15)	47 (20.1)	117 (50)	23 (9.8)	77.65	<0.0000001
Post-test (n=232)		5 (2.2)	8 (3.4)	5 (2.2)	149 (64.2)	65 (28)		

Q17.I usually take antibiotics for cold or sore throat

Pre-test (n=234)	Frequency (%)	12 (5.1)	72 (30.8)	59 (25.2)	68 (29.0)	23 (9.8)	21.37	=0.00026
Post-test (n=232)		8 (3.4)	50 (21.6)	35 (15.1)	98 (42.2)	41 (17.7)		

Q18. I would prefer this learning method for antimicrobial stewardship programme (ASP)
A. Power point presentation on ASP
B.A chapter in a textbook on ASP
C.A practical session and lecture on ASP
D. Hand-outs

Pre-test	Frequency (%)	A-58 (24.8)	B-71 (30.3)	C-105 (44.9)	D-0 (0)	-	74.28	<0.0000001
Post-test		A-41 (17.7)	B-8 (3.4)	C-180 (77.6)	D-3 (1.3)	-		

Q19.A health care professional must be allotted in each OPD/IPD for auditing of antibiotic prescription

Pre-test (n=234)	Frequency (%)	33 (14.1)	93 (39.7)	102 (43.6)	5 (2.1)	1 (0.4)	66.21	<0.0000001
Post-test (n=232)		79 (34.0)	122 (52.6)	28 (12.1)	2 (0.9)	1 (0.4)		

Q20.What do you expect from ASP as a medical undergraduate
A. It will increase burden on undergraduates
B. I would like to learn more
C. I can spread awareness about optimal use of antibiotics

Pre-test (n=234)	Frequency(%)	A-3 (1.3)	B-123 (52.6)	C-108 (46.1)	-	-	70.55	<0.0000001

| Post-test (n=232) | A-0 (0) | B-39 (16.8) | C-193 (83.2) | - | - | | |

SA-Strongly agree, A-Agree, NS –not sure, D-disagree, SD-strongly disagree

In all the knowledge and attitude assessing questions it was evident that the response of the students were improved and found to be highly significant (p<0.0000001) after post-test. Except for the question where student were asked whether they have heard about antibiotic stewardship programme before the class lecture on this topic ,in both pre and post-test 68.4% and 69% have said NO. Which was statistically insignificant (p>0.05)

DISCUSSION

Antimicrobial resistance is not a new topic in academics. But yes teaching its prevention is always challenging because it is more of an act then talk. Guiding the future physician about appropriate, rational use of antibiotics and its importance is a task that need to be fulfilled. Here we assess the knowledge and attitude of seconder year medical undergraduates towards antimicrobial resistance and antimicrobial stewardship programme. To the best of our knowledge very few studies are available on this topic. In our study both in pre and post-test, male students were more 63.2% and 62.5% respectively similar to study conducted in Zambia where male were 68.1%.[2] Majority of the students in both the test accepted that they had received antibiotics in the past about 98.3 % and 99.6% both in pre and post-test. Similar to *Gupta et al* study they reported 83.3%.[5]

Knowledge of students – response has changed from agree in pre-test to strongly agree in post-test to a question whether antimicrobial resistance is national and worldwide public health problem 68.5% and 65.1% respectively similar to study conducted in Karnataka.[6] Clinical Problem based learning can be taken to enhance the knowledge about antimicrobial resistance and how to avoid it. 49.1% strongly agree that self-administration can be one of the main cause of AMR in post- test. Which is in accordance with study *Asharani et al*.[7] ASP is new to most of the students as 68.4% and 69% said they never heard of this term before the class in pre and post -test respectively. Similar to *Nisabwe et al* where they have reported 83.4%.[8] Students who heard of this term is mostly through internet. It can be a good opportunity to start teaching ASP at the early stage of medical education while parallel implementation of ASP in hospital.

Knowledge regarding ASP has greatly improved as seen in post-test in regard to its association in controlling AMR (from 16.2 to 58.1%), optimizing antibiotic prescription (from 20.1% to 56.7%) and its goal (from 18.8% to 77.2%). Correct response to question on meaning of de-escalation in ASP was increased from 40.2 % in pre-test to 91.4% in post-test. Although the knowledge has been improved but since ASP and its committee are in initial phase in our medical college, student's exposure in this field is still primitive.

Attitude of students-we have found positive attitude towards AMR and ASP. After the class most the students 78.9% strongly agree that this is the right time to implement ASP which will be beneficial not only for the patients but also for the student learning purpose. They also strongly agree (68.5%) that this enhance their knowledge on appropriate antibiotic use and prescribing it in future. Attitude towards utilization of clinical posting time in auditing the prescription for antibiotic has shown only little improvement .Only 49.6 % from 41.9% after post-test agree to it. They are not confident enough in auditing prescription so we can work in this area. Students have shown positive attitude both in pre 50% and post- test 64.2% in regards to not considering ASP guidelines and committee as an obstacle in clinical care. When asked whether they take antibiotics for cold and flu 30.8% agree in pre-test while in post-test 42.2% disagree to it. Similar to *zulu A et al, Kandasamy G et al* study.[2,9] Their basic knowledge towards antibiotic administration has enhanced and now they themselves became aware as what medication they were taking and where they were wrong. To learning method preference question, both in pre and post-test students shows interest in practical along with lecture session on ASP. Similar to study conducted in UK.[10] So inclusion of clinical case discussion, assignments while teaching ASP and AMR provide better outcome. Answer to question whether health professional must be allotted in OPD/IPD for auditing of antibiotic prescription, 43.5% were neutral in pre-test while in post-test 52.6% agreed. Since AMR is a real threat to the society, taking action has become a necessity. Lastly when asked what they expect from ASP as a medical undergraduates, in pre-test 52.6% wanted to learn more while in post-test 83.2% wanted to spread awareness about optimal use of antibiotics. This is a good sign as without learning one cannot spread awareness about its importance.

CONCLUSION –

The study is assessing the knowledge and attitude of second year medical undergraduates towards AMR and ASP. Which has significantly improved from pre-test to post-test. We have tried to explore their point of view towards different learning methods on these key topics. However after implementation of ASP in the hospital and involvement of students in day to day antibiotic prescribing activity without making it burden we can say our educational interventions has become efficiently successful. Also our study is single centred, more exploration on different methods of educational intervention and its impact on students can be achieved through multicentre study.

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