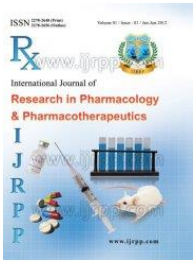
International Journal of Research in Pharmacology & Pharmacotherapeutics



ISSN Print: 2278-2648 ***IJRPP |Vol.8 | Issue 3 | Jul - Sep - 2019***
ISSN Online: 2278-2656 ***Journal Home page: www.ijrpp.com***

Research article ***Open Access***

Curtailing self medication to combat antimicrobial resistance –a KAP study

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ABSTRACT

Background

Self medication of antibiotic leads to Antimicrobial resistance (AMR) and is going to become a global epidemic. The purpose of National Action Plan for AMR is to improve awareness and understanding of AMR through educational training and effective communication.

Objective

To analyze the knowledge, attitude and perception about AMR and to spread awareness and improve knowledge so as to optimize antimicrobial use.

Materials and Methods

A cross sectional survey was carried out among 2nd year MBBS students in July 2019 with the help of a questionnaire consisting of 30 questions. The results were analyzed with the help of percentage and chi square test was used to see statistical significance.

Results

Out of 112 respondents 70.43%, 57.28%, 68.5% students answered correctly to the questions in knowledge, attitude, and perception respectively. The most commonly self medicated antibiotics were Amoxicillin and Fluoroquinolones (25%) followed by Azithromycin (16%).

82.1% were aware that antibiotics target bacteria, but 47.3% and 31.2% had a perception that they were effective for fungi and viruses as well, and 40% said it was effective for all.

81.2% agreed that taking antibiotic only when prescribed will prevent AMR. Only 36.6% students knew that we should give fewer antibiotics to food producing animals, 70.5% felt that newer antibiotics are better than old ones and 71.4% believed that it necessary to complete the course of antibiotics.

Conclusion

Our study provides an important insight regarding knowledge, attitude and perception of medical undergraduates and the results can be considered while formulating a need based undergraduate curriculum regarding antibiotic usage and AMR. Since these students will be role model for citizens and patients, it is important to sensitize them, so as to bring a behavioral change which impacts human health tremendously.

Keywords: Antimicrobial Resistance, Knowledge, Perception, Self medication

INTRODUCTION

Self medication of antibiotics is a global phenomenon and is an unhealthy practice leading to Antimicrobial resistance (AMR) affecting humans, animals and plants. Antibiotics are the cornerstone of basic and modern treatment and a major contributor to increasing life expectancy. When the term antibiotic was first coined by an American microbiologist Waksman and his colleagues, it meant chemical substances produced by micro organisms and having antagonistic effects on the growth of other micro organisms. It excluded synthetic antimicrobials e.g. sulfa drugs and biological products of non microbial agents having antagonistic effects on bacteria [1]. But nowadays antibiotics include all substances produced by microorganisms as well as synthetic antimicrobials. The first objective of National Action Plan on Antimicrobial Resistance (NAM-AMR 2017-2021) is to improve awareness and understanding of AMR through educational training and effective communication .The aim of our study is in accordance with this plan [2].

Self medication is defined as selection and use of medicines by individuals to treat self recognized/diagnosed conditions or symptoms without a medical practitioner's supervision. It has both benefits and risks. It is of benefit as it gives immediate relief leading to decrease in morbidity and minimizing expenditure for minor ailments but is risky if the medication taken is wrong or for inappropriate duration, leading to prolonged hospital stay, higher medical cost and the chances of severe adverse drug reactions which may increase morbidity and develop microbial resistance [3].

Antimicrobial resistance is defined as ability of microorganisms to resist and survive after they have been exposed to a specific antibiotic or antimicrobial that normally would kill them or inhibit their growth, so that the treatment becomes ineffective, infection unresponsive and may spread to others [4]. Use of antibiotics has increased over the years and in US alone 1.4 billions of antibiotics were dispensed during 2000-2010 and the use of broad spectrum antibiotics doubled from 2000 to 2010 [5]. In a cross sectional study comprising 26 countries in Europe, the highest rate of antibiotic use calculated as daily dose per 1000 inhabitants was in France and lowest in Netherlands [6] We have no such data for antibiotic consumption in India but the global data suggest that we may be in the same footsteps. So as use increases, misuse also increase and this is a major cause of AMR.

OBJECTIVES

AMR is a rapidly progressing serious problem and World Health Organization (WHO) in 2015 initiated a global plan to improve awareness and understanding through effective communication, education and training. Easily practiced step which can be taken to minimize antibiotic use is to spread awareness through educational campaigns among the general public as well as prescribers about.

a. Preventing infection by adopting hygienic measures
b. Using antibiotics only when prescribed.
c. Stopping Antibiotics when symptoms have resolved [7].

Prescribers play an important role not only through rational prescription but by promoting awareness about safe medication practice among patients. So the undergraduates who will be future prescribers need effective educational intervention so as to sensitize them about judicious use of antibiotics. KAP survey is cost effective, cross sectional analysis which helps to gather both quantitative and qualitative information and reveals any gaps in knowledge and brings about behavioral changes [8]. The objectives of our KAP survey conducted are:

(a) Spread awareness and understanding of antimicrobial resistance.
(b) To improve knowledge
(c) Optimize use of antimicrobials.

MATERIALS AND METHODS

This cross sectional survey was carried out among 2nd year MBBS students who had completed the full syllabus of pharmacology, on a single day without prior information. Participation was voluntary, anonymous and ethical clearance was obtained from the Institutional Ethical Committee. Before the distribution of questionnaire the intention of the survey was explained to the participants. The questionnaire was compiled after a detailed review of literature [7, 9-15] and consisted of 30 questions, ten each to access knowledge , attitude and practice, and the likert items were divide into three categories as YES, NO, and DON'T KNOW and some were open

questions. Social demographic information gender and residence were asked from the participants.

DATA ANALYSIS

Descriptive statistics were used to summarize the variables to generate frequencies and percentage. Wherever it was relevant chi square test was used and a probability value of ≤0.05 was considered as statistical significant.

RESULTS

Demography

A total of 112 respondents completed the questionnaire out of 150 students, incomplete questionnaires were excluded in data analysis.66 were females and 46 were male students. Students had a good knowledge (70.43%), fair awareness (57.28%), and 68.5% would do rational practice in future as calculated from the correct response.

Table 1: Knowledge Questions

S.No	Questions based on likert scale	YES	NO	DON'T KNOW
1.	Students who defined self medication correctly	68 (60.7%)	------	-------
2.	Whether self medication of antibiotics taken	70 (62.5%)	38 (33.9%)	4 (3.5%)
3.	Awareness about antibiotic resistance	109 (97.3%)	3 (2.7%)	---------
4.	Antibiotic speed up recovery	89 (79.4%)	11 (9.8%)	12 (10.71%)
5.	Repeated use of same antibiotics decrease efficiency of treatment	82 (73.2%)	15 (13.4%)	15 (13.4%)
6.	Branded antibiotics better than generic	31 (27.7%)	50 (44.6%)	31 (27.7%)
7.	Newer antibiotics better than older ones	79 (70.5%)	9 (8.0%)	24 (21.4%)
8.	Antibiotics are safe as they have been tested in labs, & approved by regulating agency	62 (55.3%)	16 (14.2%)	34 (30.3%)

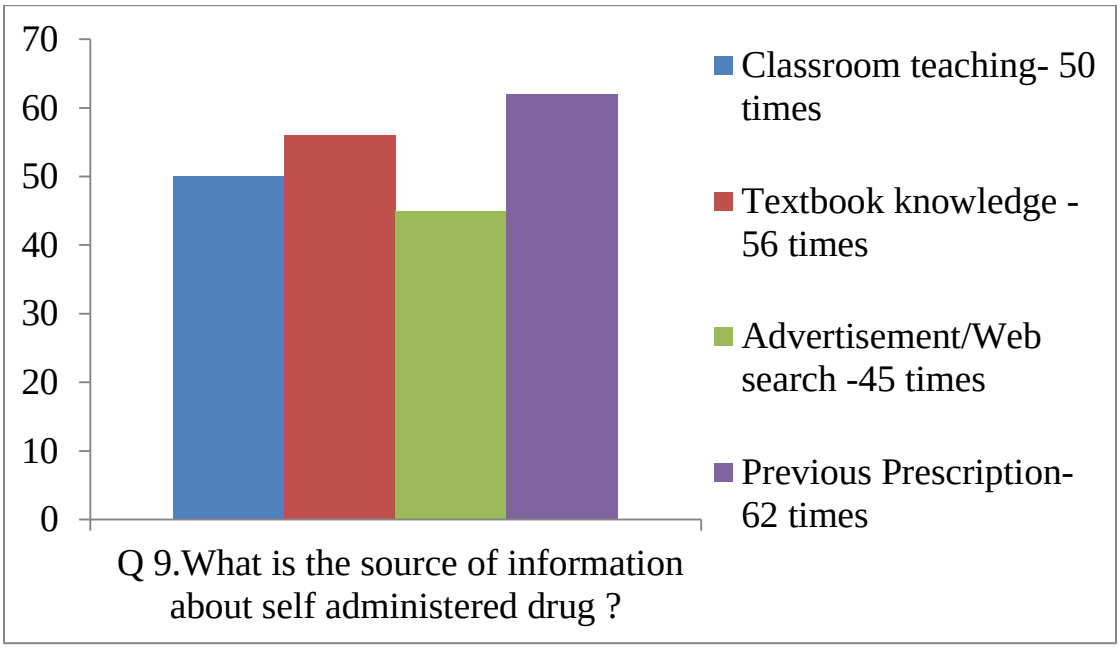

Figure 1: What is the Source of information about self administered drug

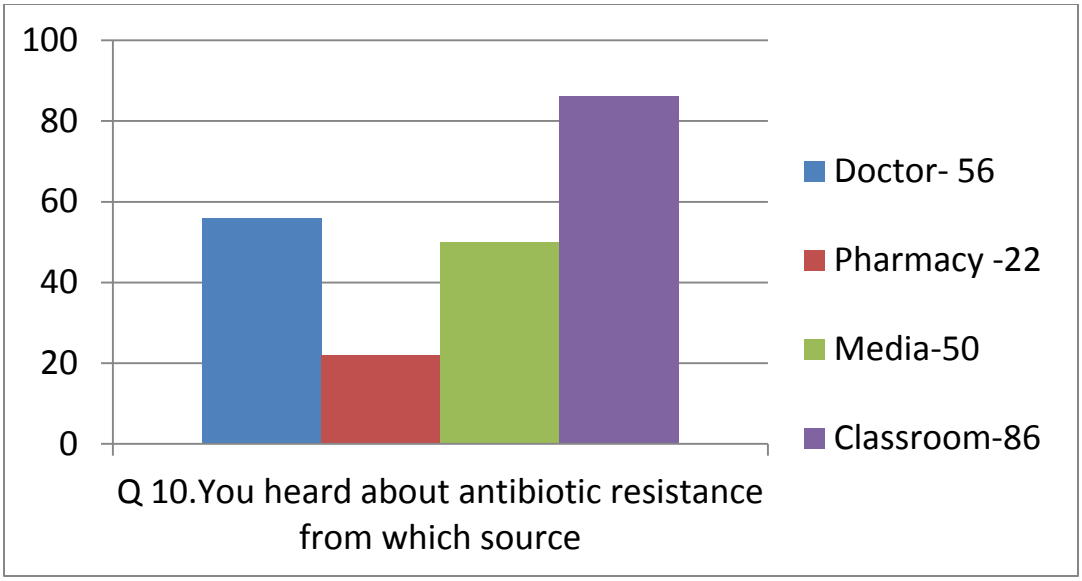

Figure 2: You heard about antibiotic resistance from which source

Table 2: Attitude Questions:

Q.	Questions: according to likert scale	Yes	No	Don't know
1.	Skipping one or two dose leads to antibiotic resistance	63 (56.2%)	28 (25%)	21 (10.7%)
2.	Antibiotic resistance is a public Health Issue	103(91.9%)	1 (0.9%)	8 (7.1%)
3.	Culture sensitivity must guide antibiotic prescription	82 (73.2%)	4 (3.5%)	26 (23.2%)
4.	Hospitals should have their antibiotic policy	82 (73.2%)	11 (9.8%)	19 (17%)
5.	There's abuse of antibiotic at present	68 (60.7%)	10 (8.9%)	19 (17%)
6.	Indiscriminate use of antibiotics lead to resistance	86 (76.7%)	4 (3.5%)	22 (19.6%)
7.	Antibiotic resistance affect you and your family's health	85 (75.9%)	13(11.6%)	14 (12.5%)
8.	There should be regular CMEs on rational use of antibiotics	70 (62.5%)	3 (2.67%)	39 (34.8%)

OPEN QUESTIONS			
9.	AMR can be prevented by taking	Yes	No
a.	antibiotics only when prescribed	91 (81.2%)	21(18.7%)
b.	animal handlers should give fewer antibiotic to food producing animals	41 (36.6.%)	71(63.3%)

MULTIPLE CHOICE QUESTIONS		
10.	What are the factors that lead you to self medication	Yes
a.	Simple ailments can be self treated by self medication of antibiotics	72 (64.2%)
b.	Time spent on consultation	45 (40.1%)
c.	Consultation fees	37 (33.0%)
d.	Old prescriptions are effective	34 (30.3%)
e.	Pharmacists have good knowledge	23 (20.5%)
f.	No nearby medical facility	14 (12.5%)

Almost similar responses found for factors like consultancy fees, time spent on consultation, no nearby medical facility, old prescriptions and pharmacist's knowledge which also lead to self medication. When asked to enumerate the antibiotic taken for self medication, Amoxicillin and

Fluoroquinolone was taken by 25%, Azithromycin by 16% and Cephalosporin by 6.25% students.

Statistical analysis of their Attitude towards animal handlers using fewer antibiotics for food producing animals to reduce antibiotic resistance: shows that 43.4% males and only 31.8% females were aware about it. (Chi square test x^2 = 3.86, dof = 1, p= 0.0493).

Table 3: Practice Questions

Q.	Questions	Yes	No
1.	Do you complete full course of antibiotic	80 (71.4%)	32 (28.5%)
2.	Do you consult a doctor before starting antibiotics	90 (80.3%)	22 (19.6%)
3.	Do you use left over antibiotics for next time for same illness	58 (51.7%)	54(48.2%)
4.	Do you use same antibiotics for family, friends for same illness	66 (58.9%)	46 (41.1%)
5.	Do you return for follow up after antibiotic treatment	51 (45.5%)	61 (54.4%)
MULTIPLE CHOICE QUESTIONS			
6.	When do you use antibiotics for skin		Yes
a.	skin infections		66 (58.9%)
b.	Diarrhea		64 (57.1%)
c.	common cold		62 (55.3%)
d.	burning micturition		51 (45.5%)
e.	fever		48 (42.9%)
f.	acute bronchitis		42 (37.5%)
7.	Where do you obtain antibiotics from		97 (86.6%)
a.	pharmacists without doctor's prescription		97 (86.6%)
b.	consulted Doctor's on telephone without undergoing clinical examination		51 (45.5%)
c.	using previous prescriptions		35 (31.2%)
d.	Parents		34 (30.3%)
8	When did you last take antibiotics		
a.	in last one month		48 (42.8%)
b.	within one year		65 (58.0%)
9	When do you stop taking antibiotics once you have begun treatment		
a.	When the course of antibiotic has finished		77(68.7%)
b.	as symptoms get relieved		34 (30.3%)
10	You use antibiotics for infections with		
a.	Bacteria		92(82.1%)
b.	Fungi		53 (47.3%)
c.	Virus		35 (31.2%)
d.	All (bacteria ,fungi ,virus)		38 (40%)

DISCUSSION

A wide range of antibiotics are available in India which can be procured over the counter and without prescription which facilitates self medication. Mean correct responses on knowledge, attitude and practice of study participants are 70.43%, 57.28%, and 68.5% respectively. Our study shows that students had a good knowledge about role of antibiotics, their use and reasons for resistance. 65.40% students answered all the questions correctly with following exceptions:

① Animal handlers should give fewer antibiotics to food producing animals: which is a scientific fact. Only 36.6% students said yes and 63.3% were unaware. This means that our students don't understand that the food chain also contributes to AMR and action at this level should also be taken to solve the AMR. When compared with other studies from India, Italy and a WHO study, the correct responses were 66.55%, 90% and 73% respectively [10, 15] and [9]. Most antibiotics used in animals are similar to humans and there is a potential threat through pathogens in food and some of these pathogens may be resistant to particular antibiotics. Though studies cannot exactly quantify the extent to

which antibiotic use in animals would cause resistant infection in humans, researchers have found that (a) antibiotic resistance against E.coli and Camplylobacter increase in humans as use of antibiotics increase amongst animals. (b) Genetic makeup of the bacteria has provided very strong scientific evidence that antibiotic resistance to campylobacter and salmonella are transferred from animals to human. Rapidity of multiplication and continuous exchange among animals, humans and agricultural hosts leads to dissemination of antibiotic resistant gene .Gene exchange can occurs in soil or more likely in the gut of human or animal. [16]

② 40% students said antibiotic are used for all infections (bacteria, viruses, fungi). As per WHO antibiotics are medicines used to prevent and treat only bacterial infections and antibiotic or antimicrobial resistance encompasses resistance to drugs use to treat all bacterial, viral, fungi and parasitic infection[17].This means that student had inadequate knowledge about the effectiveness of antibiotic on viruses and fungi. Similar study conducted on public in Lithuania, 26% population believed antibiotics are effective in treating viral but not bacterial infection and 21% believed they are effective in treating both bacterial and viral infections [18]. In another study conducted in Europe 54% of them responded incorrectly about the effectiveness of antibiotics on viruses [2]. In an Italian study, 82.3% had the knowledge that antibiotics are inappropriate for viral infection and 95.2% were aware that they can be used only for bacterial infections [15].

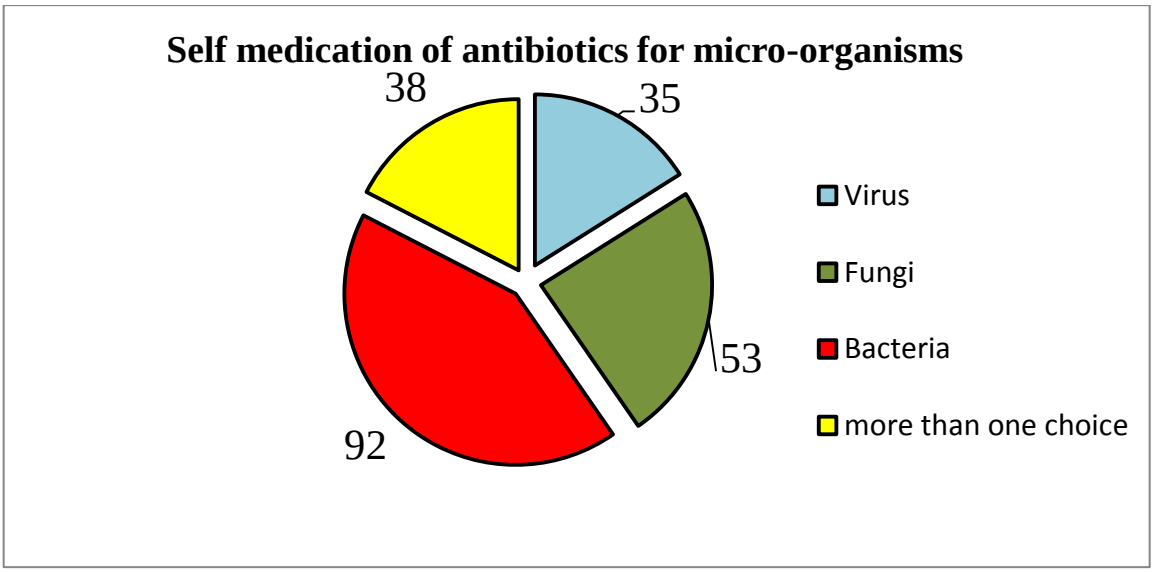

Figure 3: No. of students who take self medication of antibiotics for micro-organisms

③70.53% students in our study had a misconception that "newer antibiotics are better", which resemble the study among Chinese students who also had similar misconception (77.7%) [11]. Samina Farahat et al conducted a similar study in India where 96.5% students answered correctly [12]. As we all know that newer antibiotics have newer mechanism of action and are effective against strains which are resistant to existing antibiotics but they may not necessarily be better. Bacteria acquire resistance by many biochemical mechanisms, and mutation is the commonest of all. Bacterial species became varied in their susceptibility to an antibiotic, like strains of Streptococcus pneumoniae were sensitive to benzyl penicillin but E.coli were not to the same MIC (minimum inhibitory concentration). This introduced the concept of resistance. Antibiotic resistance was first reported in 1940 for streptococci and gonococci against Sulfonamides [19]. Penicillin was used clinically from 1940 and in 1942 penicillin resistance to staphylococcus was first reported in hospital, and subsequently in community. By 1960 more than 80% of both hospital and community acquired staphylococcus isolates became resistant to it [20]. This means it took 20 years. Colistin is a very old drug discovered in 1980s but then had limited use due to toxicity, and resistance to Colistin is rare. Resurgence in use of Colistin as last

line antibiotic in Multi drug resistant gram negative bacteria resistant even to Carbapenems began in late 1990s. Data sentry surveillance program shows high susceptibility rates to Colistin worldwide until 2010. However resistance increased from 6.6% in 2010 to 9.4% in 2014 among Enterobacteriaceae leaving no therapeutic options for treating these infections and calls for a global approach to antimicrobial resistance [21]. For 40 years or so on new class of antibiotic has been discovered. Linezolid, a synthetic antibiotic approved in 2000 for adults, and in 2005 for children was a new class effective against gram positive organisms including those caused by Methicillin Resistant Staphylococcus aureus and Vacomycin Resistant Enterococci (MRSA/VRE) and very soon Linezolid resistant Staphylococcus aureus was isolated in 2001 [22]. In India, first Linezolid resistant Staphylococcus haemolyticus was reported in 2012 [23] and first Linezolid resistant Enterococcus faecium was reported in 2014 [24]. This shows that newer antibiotics will also become resistant if misused. On the other hand we see that the recommended first line antibiotics for most uncomplicated cystitis are still older antibiotics like, Nitrofurantoin, Fosfomycin, Cotrimoxazole, (discovered in,1954, 1969 1974 respectively) [25, 26]. Limitations of newer antibiotics: a) If we start treatment with a new antibiotic with new mechanism of action and resistance develops to it, then we will have no option so they should be reserved for use after older antibiotics have been exhausted. b) Newer antibiotic are costly. WHO has said that by 2050, 10 million people will die each year as a result of antibiotic resistance which will result in decrease in GDP and increase in health expenditure [27]

④ 71.4% stated that completing the course of antibiotic was necessary to prevent resistance whereas a similar study [13] showed that 66.6% medical students felt so and 64% public [9] was also of similar view. But WHO recommends different treatment duration and doses of antibiotics for different infections on the basis of clinical evidences. Limited number of studies have investigated the correct duration of antibiotic to be effective. In a recent clinical trials it is found that treatment for a community acquired pneumonia and cellulites, five days are as good as seven days or continued only till symptoms resolved. So a follow up visit to the physician is must, who will decide when to stop treatment. However streptococcal pharyngitis and otitis media or deep seated chronic infections require longer treatment [28].

Therefore the course doesn't depend upon the antibiotics but the disease and resolution of symptoms in other words "customization" is required. 73.2% had correct knowledge regarding prolonged and repeated exposure to antibiotic which forces microorganisms to either adapt or die (selective pressure) and the once which adapt carry the resistance gene which may be transferred to other strains within the species or to unrelated species. Students had a very promising attitude towards prevention of antibiotic resistance and majority felt that culture sensitivity reports will guide their prescriptions and they would follow hospital antibiotic policy and refrain from indiscriminate use of antibiotics.

CONCLUSION

If Antibiotic microbial resistance is not combatted, and no new antibiotics are discovered, then there is a threat that we will return to pre antibiotic era. Emerging new mechanism of resistance and its spread globally will make treatment of common infections difficult or impossible, hence antimicrobial therapy should not be curtailed till the clinical symptoms of patient resolve irrespective of the duration of therapy. We Indians have an easy access to antibiotics so the antibiotic resistance epidemic might begin here only. Our study provides an important insight regarding knowledge, attitude and perception of medical undergraduates and the results can be considered while formulating a need based undergraduate curriculum regarding antibiotic usage and AMR and formulating hospital antibiotic policy.

Acknowledgement

The authors would like to thank faculty and residents of Department of Pharmacology Pt. JNM Medical College Raipur (C.G.) who helped in developing the questionnaire and medical students who participated in the study.

Conflict of Interest: None

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