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Comparison of health care professionals' and laypeople's knowledge, attitudes, and practices on the use of antimicrobial and antimicrobial resistance

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Abstract:

BACKGROUND: The discovery of antimicrobials is a pioneering step in health sciences concerning preventive care and early management for infectious diseases. However, with advancements in health sciences, inappropriate knowledge, practices, and over-the-counter medications were often used by the general population in underdeveloped nations like India without thinking about its consequences which leads to the use of antimicrobials excessively or inadequately, which is also a factor for antimicrobial resistance. This quantitative study determines the awareness of healthcare professionals and laypersons about usage and resistance of antimicrobials.

METHODS AND MATERIALS: Research was carried out in rural tertiary teaching hospital of study participants were 106 nurses, 115 interns, 107 junior residents, and 97 laypersons using a "self-administered WHO questionnaire". SPSS version 27.0 software was used to analyze the data. The *P* value cut-off for significance was established at <.05.

RESULTS: Forty seven percent of nurses and 44% of interns consumed antimicrobials in the last month, more than interns and junior residents. Fourteen percent of interns and 13% of laypersons did not get any prescription for lastly taken antimicrobial. The majority of participants obtain prescribed antimicrobials from medical stores and pharmacies. Fifty five percent of laypersons and 59% of nurses stop taking antimicrobials when they feel better. Only 13% of nurses were aware of the proper indications of antimicrobials for the same illness. Only 22% of respondents know the term superbugs, significantly less than the other key terms related to the antimicrobials. Nurses and laypersons had some misconceptions related to the mechanism of development of antimicrobial resistance.

CONCLUSIONS: The analysis revealed that a significant lack of knowledge and various misconceptions were primarily seen in the nurses and laypersons. In contrast, medical graduates such as interns and junior residents lacked the right attitude and perspective regarding the use of antimicrobials and their resistance.

Keywords:

Antimicrobial, antimicrobial resistance, health care professionals', laypeople's

Introduction

Antimicrobial resistance is the incompetence of an antibiotic to halt the spread and proliferation of bacteria[1] and is associated with abuse, overconsumption,[2] self-medication, lack of knowledge regarding the use and side effects, and over-the-counter medications provided without prescription.[3] The threat posed by antimicrobial resistance is expanding nationally and internationally.[4,5] The

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emergence of antibiotics shows a remarkable achievement in the tussle against infection. Still, due to their widespread use,[6] antimicrobial resistance develops, accelerating the mortality, morbidity, and overall administrative cost burden[6,7] where the country like India is already being fighting with continuous underfunding.[8] In remote and rural areas of India, there is scarcity of physicians and other medical expertise which leads to inappropriate use of antimicrobials.[9] As per a multicentric survey, although the Layperson has some knowledge and attitudes surrounding the usage of antimicrobial and Antimicrobial resistance AMR, there are still significant gaps and inconsistent behaviours.[10] Furthermore, India experience the highest incidence of infectious diseases; therefore, antimicrobials are very crucial in reducing morbidity and mortality caused by the infectious diseases.[11] Fully understanding how to use new antimicrobials adequately can aid in tackling these challenges.[12] It is estimated that antimicrobial resistance will cost another 10 million deaths[2] in next 50 years and death rate was six lakh per year. Deaths caused by cancers and Road traffic accident RTA was equal to deaths due to AMR.[13] AMR and drug residue in foods of animal origin are caused by the use of antimicrobials in animal production.[1] As per the World Health Organization, training medical students and healthcare professionals in "antimicrobial stewardship,"[14] also known as rational antimicrobial prescription, is a crucial component of all efforts to restrict the spread of antibiotic-resistant bacteria.[15,16] Appropriate knowledge of healthcare professionals[17,18] plays a very crucial role to stoppage the inappropriate use of antimicrobials[19] and antimicrobial resistance.[20] Delayed antibiotic prescription is another method established to decrease the improper use of antibiotics in cases when the clinical reason is unclear.[21] To improve risk assessments on the origin, dissemination, and control methods of AMR at the human-animal-local environment interfaces, one health approach may be used.[7] The study was conducted in the era of COVID-19 pandemic which aim to learn more about healthcare professionals' (HCPs) and laypeople's knowledge of antimicrobial administration and antibiotic resistance in rural teaching tertiary care centre.

Aims and Objectives

To appraise the knowledge attitude and practice of HCPs and laypersons regarding the usage of antimicrobial agents and antimicrobial resistance.

Study site and population

Our cross-sectional study was carried out in rural tertiary care teaching hospital. Our study's population consisted of health professionals, including junior residents (all three-year batches of JRs were taken into consideration), MBBS interns, nurses from the IPD wards, and a layperson (a patient and their companion) who attended the medicine OPD for medication.

Materials and Methodology

Study participants and sampling

On the basis of studies revealing pattern of prescribing antimicrobials, we ascertained a prevalence of inappropriate use of antimicrobials practice among healthcare professionals of 50% with alpha = 5%, design effect of 1%, and 5% acceptable margin of error. Three hundred eighty four was determined to be the minimum sample size with the following stratification, 96 junior residents, 96 interns, and 96 nurses were included in the three categories of healthcare professionals and 96 laypersons.

Selection criteria

1. Healthcare workers practised in a rural tertiary care hospital, such as junior residents, interns, and nurses.
2. Layperson patient and their companion visiting medicine OPD.
3. Participants who agreed to be a part of this study.

Exclusion Criteria

HCPs and laypersons who are not willing to participate were excluded from the study.

Study design and setting

Survey tool was developed by specialized research agency Good Business in collaboration with WHO. This questionnaire used in October 2015 in 9,772 respondents from 12 countries having 13 question-based survey.[22] A "self-administered WHO questionnaire" in English and Marathi language was used as a survey questionnaire to quantify HCPs' and laypersons' knowledge, attitude, and practice of proper antimicrobial prescription and antimicrobial resistance.[23] Thirteen questions make up the WHO questionnaire, which evaluates individuals' knowledge, attitude, and practice in the areas of (l) antimicrobial usage, (2) antimicrobial knowledge, (3) knowledge about antimicrobial resistance, and (4) environmental variables contributing to antimicrobial resistance. The following ratings are given for responses to determine the participants' knowledge, attitude, and practise. Yes = 1, No = 2, Can't remember = 3, and we used the following scoring systems to determine the results of various knowledge attitude and practise activities: Agree = 1, Neither agree nor disagree = 2, and Disagree = 3.

Ethical consideration

The institutional ethics committee was consulted before the study was started. After getting a written informed consent, the individuals who met the study's eligibility requirements were notified about the study and included. The confidentiality of the data was guaranteed to the participants.

Data collection technique

We began gathering data in June 2020 and continued until June 2021. The replies were gathered throughout the COVID-19 pandemic. Every participant was given 60 minutes to mark their responses in the provided questionnaire**.** The demographics characteristic of the participants was noted. Prior to data collection, the self-administered WHO questionnaire was pretested. The HCPs were given the WHO questionnaire and instructed to mark the right responses. HCPs received the questionnaire on an individual basis. An excel sheet was used to collect the data. The WHO questionnaire was translated into Marathi for the general public to collect data. An interview was conducted with an uneducated layman in their native tongue and the responses were recorded. To help subjects overcome their literacy challenges, both solutions were made available.

Data Analysis

We used the statistical software SPSS Version 27.0 to conduct our research. Descriptive statistics, frequency analysis, and percentage analysis were used to characterize data for categorical variables, while mean and standard deviation were employed for continuous variables. The Chi-square test was used to determine the significance of categorical data (that is, to test the difference in proportions between two groups). The probability value of. 05 is used as the significance level in all of the above statistical tools.

Result

Demographic characteristics

The demographic characteristics of our study are shown in Tables 1 and 2.

Knowledge of use of antimicrobial and antimicrobial resistance:

Participants were questioned if they were familiar with a set of terminology widely used in discussions about antimicrobial resistance. The highest level of awareness is seen for antimicrobial resistance (67.21%). This was closely followed by drug resistance (56.21%) and antimicrobial-resistant bacteria (54.57%). Only 22.24% of respondents had heard the term superbugs, as shown in Figure 1.

The respondents were inquired if the following statement was true or false: "It is okay to use antibiotics that were given to a friend or family member, as long as they were used to treat the same illness." The fact is that this is a false statement. Significant lack of knowledge is seen in total respondents about this statement (*P* value is <.001). Notable lack of knowledge is seen in nurses (84, 77.78%) and laypersons (49, 50.52%). After then, survey participants have presented a second statement and asked if they believed it was true or false: "It is okay to buy the same antibiotics or request these from a doctor if you are sick and they helped you get better when you had the same symptoms before." It is a false statement. Significant lack of knowledge is seen in total respondents about this statement (*P* value is <.001). Interns (52, 45.61%) and junior residents (72, 67.92%) have significant knowledge but there is a lack of knowledge is seen in nurses (18, 16.67%) and laypersons (45, 46.39%). Respondents were given a set of statements and asked if they were true or false to determine their degree of comprehension of antimicrobial resistance concerns. The majority of respondents (87.74%) marked that antibiotic resistance occurs when your body becomes resistant to antibiotics and they no longer work as well this statement was true, and only 12.26% responded that this statement was false (*P* value < .001). Whereas interns (22.12%), junior residents (13.21%), nurses (9.26%), and layperson (3.09%) marked that this statement is false. 12.04% nurses marked false response for numerous illness are getting resistance to cure with antimicrobials (*P* value. 004). Among the healthcare workers 19.47% interns and 12.62% layperson stated that it may be highly challenging or perhaps impossible to cure the diseases caused by bacteria if they are resistant to antibiotics was a false statement (*P* value. 034). 70.54% interns, 78.30% junior residents, 85.19% nurses, and 66.67% layperson stated that the transmission of antimicrobial-resistant bacteria from one person to

Table 1: Characteristic of study participation (Healthcare worker)

	No (*n*=328)	%
Profession		
Nurses	106	32.3
Interns	115	35.1
Junior residents	107	32.6
Gender		
Male	174	53
Female	154	47
Residency		
Urban	215	65.5
Suburban	92	28
Rural	21	6.5

Table 2: Characteristic of study participation (Layperson)

Layperson	No (*n*=97)	%
Gender		
Male	59	60.8
Female	38	39.2
Residency		
Urban	72	74.2
Suburban	15	15.5
Rural	10	10.3

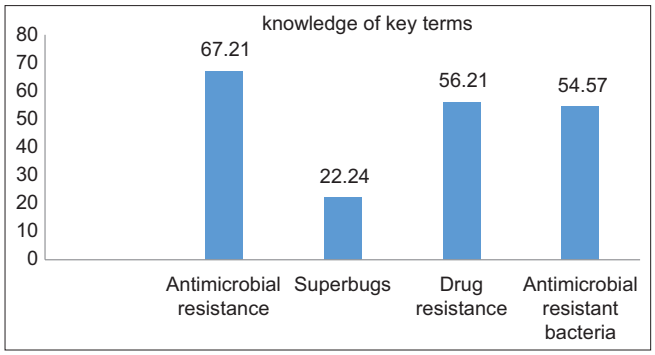

Figure 1: Understanding of relevant keywords linked to antimicrobial resistance

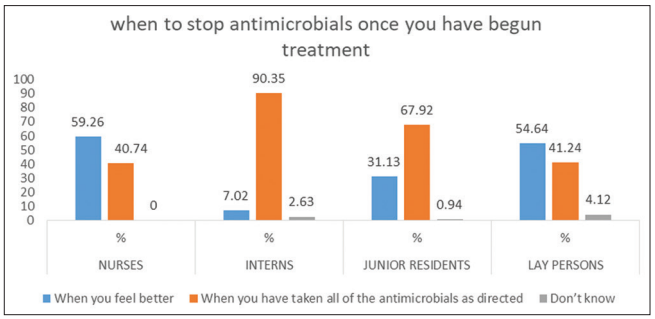

Figure 2: Shows the duration of antimicrobial use among the various population

another is possible was true statement (*P* value. 010). We asked respondents if they believed that certain actions would help them address the issues of AMR and improper use of antimicrobial. The majority of survey participants, including nurses (99.07%), interns (96.26%), junior residents (97.17%), and laypeople (80.42%), agreed that antibiotics should only be administered when a doctor or nurse has prescribed them, demonstrating their substantial understanding (*P* value. 001). The majority of nurses (76.85%), interns (75.46%), junior residents (73.59%), and layperson (87.63%) agreed (*P* value. 001) that farmers should use less antimicrobials on animals reared for food.

Attitude toward the use of antimicrobial and antimicrobial resistance:

All the respondents were questioned regarding the stoppage of antimicrobials once they were prescribed. The WHO recommends that people take the entire prescription. The 259 respondents (60.94%) across the survey respond that it is essential to take complete course of antimicrobials prescribed by physician represent in Figure 2.

Respondents were given a set of statements and asked if they were true or false to determine their attitude toward the antimicrobial use and antimicrobial resistance. More than half of respondents nurses (n = 96, 89.72%), interns (n = 94, 87.04%), junior residents (n = 96, 90.57%), and laypersons (n = 70, 72.16%) answered that antibiotic resistance could affect me or my family statement was true, which shows their good attitude (*P* value. 001) toward the antimicrobial use and antimicrobial resistance. Twenty five nurses (23.15%) answered that in some countries, antimicrobial resistance is a problem, but not in ours which was false but majority of interns (n = 91, 82.73%), junior residents (n = 75, 71.43%) answered correctly by responding that this was a false statement but half of the laypersons (n = 50, 52.08%) answered incorrectly by responding that this was a true statement. Having *P* value < .001 which was significant. Fifteen nurses (13.89%), 20 junior residents (18.87%), 7 laypersons (7.29%), and 52 interns (46.85%) answered correctly that only those who take antimicrobial frequently face an issue of antimicrobial resistance by responding that this was a false statement. Having a *P* value < .001 which was significant toward the attitude. Majority of nurses (56.68%), interns (89.09%), junior residents (74.52%), and layperson (73.52%) with *P* value < .001 agreed that production of newer antimicrobials by pharmaceutical companies is necessary. Nurses (96.29%), interns (91.89%), junior residents (95.28%), and laypersons (77.32%) with *P* value < .001 agreed that one of the major issues impacting the globe today is antimicrobial resistance. Whereas nurses (93.52%), interns (71.18%), junior residents (74.53%), and a layperson (70.84%) with *P* value < .001 agreed that antimicrobial resistance will be resolved by medical professionals before it gets out of hand. Most of the nurses (96.3%), interns (93.27%), junior residents (92.45%), and layperson (89.69%) with *P* value < .001 agreed that it is everyone's obligation to use antimicrobials responsibly. Nurses (81.48%), interns (34.55%), junior residents (28.,3%) and layperson (57.73%) with *P* value < .001 agreed that antimicrobial resistance is an issue that people like me are unable to combat. Majority of nurses, interns (87.39%), junior residents (90.57%), and layperson (88.66%) with *P* value < .001 agreed that antimicrobial resistance worries me about how it may damage my family's health and myself. Most of nurses (98.15%), interns (63.96%), junior residents (82.08%), and layperson (83.51%) with *P* value < .001 agreed that as far as I follow my antimicrobials as prescribed, I am not at danger of developing an illness that is resistant to antibiotics.

Practice toward antimicrobial and antimicrobial resistance:

Majorly nurses (47.22%) and laypersons (44.33%) consume antimicrobials in last month as compared to other study participants. Majority of respondents (85.95%) received prescribed antimicrobials from a registered medical practitioner. Three hundred fifty three (82.86%) respondents had received and 50 (11.74%) respondents had not received any advice for consuming prescribed antimicrobials. We track the responses to the activities to assess how HCPs and laypeople approach the issue of improper antibiotic use and antimicrobial resistance.

The majority of respondents concurred that hand washing should be done frequently and that parents should keep up with their children's vaccinations. The majority of nurses (91.67%), interns (93.52%), junior residents (95.28%), and laypeople (91.75%) with *P* values. 001 agreed that antibiotics should only be provided by doctors when absolutely essential. Governments must encourage the development of new antibiotics, as per the majority of nurses (52.34%), interns (86.36%), junior residents (81.13%), and laypeople (74.23%) with *P* values. 001. The majority of nurses (56.48%), interns (89.09%), junior residents (74.52%), and lay people (73.96%) with *P* value. 001 agreed that pharmaceutical corporations must provide novel antimicrobials. Mean score of knowledge attitude and practice of healthcare worker and layperson is shown in Tables 3 and 4.

Discussion

In this research, it is evident that despite being in the healthcare profession, they lack the necessary knowledge, attitude, and practice about antimicrobial uses and their resistance. Although interns and junior residents had some knowledge regarding its use and resistance, there was still a lack of perspective and attitude in clinical practice. While laypersons and nurses have some misconceptions regarding the uses of antimicrobials, this irrational use can lead to the development of antimicrobial resistance.

Table 3: Mean score of knowledge attitude and practice of health care worker regarding antimicrobial use and resistance

	No	Knowledge	Attitude	Practice
Profession				
Nurses	106 (32.3%)	11.43±1.48	16.77±2.51	5.69±2.30
Interns	115 (35.1%)	11.28±2.17	16.85±3.86	6.81±3.86
Junior residents	107 (32.6%)	10.54±1.58	14.19±1.71	5.07±1.35
Lay persons	97 (100%)	12.69±1.69	20.51±3.89	6.13±2.95
Gender				
Male	174 (53%)	11.31±1.71	16.19±2.68	6.02±3.12
Female	154 (47%)	10.84±1.90	15.69±3.52	5.73±2.47
Residency				
Urban	215 (65.5%)	10.95±1.67	15.68±2.79	5.93±3.13
Suburban	92 (28.%)	11.30±2.17	16.60±3.49	5.83±2.25
Rural	21 (6.5%)	11.57±1.36	15.95±4.09	5.57±1.74

Table 4: Mean score of knowledge attitude and practice of layperson regarding antimicrobial use and resistance

	No (*n*=97)	Knowledge	Attitude	Practice
Gender				
Male	59 (60.8%)	12.69±2.06	20.05±3.69	5.91±2.58
Female	38 (39.2%)	12.68±1.87	21.23±4.12	6.47±3.46
Residency				
Urban	72 (74.2%)	12.79±1.98	20.52±3.95	5.73±2.21
Suburban	15 (15.5%)	12.53±2.06	19.93±4.04	6.40±3.31
Rural	10 (10.3%)	12.20±1.93	21.30±3.36	8.60±5.39

1. Knowledge of participants regarding antimicrobial use and antimicrobial resistance: Most medical graduates say that it is not appropriate to use the same antimicrobial that was given to another acquainted person as compared to that of nurses (78%) and laypersons (51%) who disagree with this fact due to their less knowledge on the correct indication of antimicrobials for the same illness. Many studies resulted that there was a need to update the medical curriculum having the information of appropriate use of antimicrobial[24,25] also take necessary steps to educate the layperson regarding the appropriate use of antimicrobial.[17] Most survey participants are sufficiently knowledgeable of the fact that infections caused by bacteria resistant to most antibiotics are particularly challenging to cure. Majority of nurses, interns, junior residents, and laypersons of our study responded that antibiotic resistance occurs when your body becomes resistant to antibiotics and they no longer work as well which was similar to study conducted in India.[18] From these responses, it comes to notice that healthcare professionals and laypersons have a distinguished misconception about the development of antimicrobial resistance. Majority of participants in our study and study participant in Indonesia[26] got similar result that antimicrobial should not be stored for using them later for other illness which shows the HCWs and layperson have the knowledge regarding the use of antimicrobial. Our survey also evaluated respondents' knowledge of terms relevant to antimicrobial resistance, and the results showed that 67.21% of them were merely familiar with the term antimicrobial resistance. The probable reason for this was the few opportunities to learn about these terminologies to the nurses and laypersons. One original study reported that the majority did not hear the term superbugs of Srilanka students.[27] As per a survey done in Nepal, 84% of the participants had never heard of antimicrobial resistance or any associated terms.[7] The respondents who knew the term were questioned where they got to know about it, while most laypersons get to know about these terms from doctors or nurses and social media. This information provides that the doctors or nurses and social media play a significant role in providing the knowledge of proper use of antimicrobial and making the people aware of the antimicrobial resistance. In our study, 94% of respondents agreed with the action plan that people should use antimicrobials only when the doctors or nurses prescribe them. This finding is similar to one study, which found that 92.6% of participants thought that antibiotics should only be used when they are prescribed by a doctor.[7]

2. Attitude of participants toward the antimicrobial use and antimicrobial resistance: Most interns, junior residents, nurses, and laypeople have a positive attitude about how the problem of antibiotic resistance affects not just them but also their families. Most

interns and junior residents had positive attitude that antimicrobial resistance is a serious issue internationally, including in India, while nurses and laypeople have a negative attitude and believe that antimicrobial resistance is just an issue in other countries, not in our own. Most participants in our survey had the mistaken belief that only people who regularly take antibiotics can experience the issue of antimicrobial resistance. In our study, more than half of interns, junior residents, nurses, and laypersons agreed that cold and flu can be treated with antimicrobial. Another study found that 72.8% of participants agreed that cold and flu can be treated with antimicrobial, indicating a negative attitude toward the indication of antimicrobials in the treatment of various diseases.[26] One study conducted in India[18] reported that majority of medical students (88.6%) and also in study conducted in Jordanian[28] reported that the majority of participants (67.52%) agreed that AMR is now the biggest global issue which was world facing, similar result we get in our study that majority of nurses, interns, junior resident, and layperson agreed to this statement. Most interns, junior residents, nurses, and laypeople have a positive attitude toward the action plan, such as the development of new antimicrobials. Ninety three percent of respondents concurred that using antimicrobials responsibly is a collective duty. If I take antimicrobials correctly, my risk of developing AMR decreases, and by adhering to such an action plan, the prevalence of AMR decreases. 60.94% participants in our study agreed that it is essential to take complete course of antimicrobials prescribed by physician which was similar to one study.[18] Study conducted in Kuwait resulted that 57.6% participants agreed that they should have to take complete course of antimicrobials prescribed by physician.[29] In one study, reported that 74% of nurses, 10% interns, and 11% of junior residents stop taking antimicrobials once they feel better.[11] However, as per WHO, always follow the doctor's instructions and finish the complete course of antimicrobials that are recommended to you that help control the infection caused by the bacteria and reduce the chances of antimicrobial resistance.

3. Practice of participant for appropriate use of antimicrobial: More than half of interns, junior residents consumed antimicrobials in the past month whereas misconception regarding antimicrobials in the COVID-19 pandemic leads to increased consumption in laypersons (44%) that were prescribed by medical professionals, whereas significant consumption of antimicrobials was taken by 47% of all nurses as they were a regular part of clinical exposure and were under high risk of infection in COVID-19 pandemic and all participants received guidance on how to take those antimicrobials from a doctor or nurse. This shows that participants have good practise using antimicrobials properly and that they take antimicrobials that are prescribed by doctors rather than self-prescribed antimicrobials, which ultimately results in a decrease in antimicrobial resistance. A similar study conducted and reported that 52% of interns, 40% of junior residents, and 33% of staff nurses had self-prescribed the antimicrobials in their study[11] which leads to inappropriate use of antimicrobials; it is because of somewhat lack of knowledge among the HCPs. Majority of nurses (56.48%), interns (89.09%), junior resident (74.52), and layperson (73.96%) agreed that there is need of development of new antimicrobials which to similar to study conducted in Uganda reported that 40.7% participants agreed for development of new antimicrobials.[30] In our study, 96% of respondents agreed that people should wash their hands regularly, while 95% of respondents agreed that children's vaccination should be kept up to date by their parents and government planning for the development of new antimicrobials. This lessens the inappropriate use of antimicrobials, preventing microorganisms from developing antibiotic resistance. Most of the participants in our study have good practice level by responding that hand washing should decrease the AMR. Similar findings were also noted in study conducted in Eritrea.[31] Furthermore, most respondents obtained their antimicrobials from medical stores or pharmacies; this factor indicates the proper use of antimicrobials with the prescribed dose and schedule, essential for treating any infection but still, 7% of laypersons reported that they obtained their antimicrobials from friends or family members, leading to improper use of antimicrobials. All these factors, such as self-prescribed, improper dose, and unethical obtained antimicrobials, indicate that laypersons and healthcare worker still lack the good practice toward the antimicrobial use which increases the risk of antimicrobial resistance.

Limitations and recommendation

This study has significant limitations. Self-administered surveys are prone to social desirability bias. Additionally, since the self-administered questionnaire was completed and the data were collected from a group of participants, it is possible that respondents who answered the same questions at the same time influenced one another's responses. The questionnaire replies were frequently completed in 50 to 60 minutes, which is difficult for laypersons to recollect quickly. Because our study included numerous HCPs and laypeople in central India, the findings may be extrapolated with confidence. The study's findings recommended that to decrease the use of self-medication, it is necessary to revise the medical curricula for HCPs and launch a national campaign to educate students and laypeople about antibiotic resistance. Additionally, it urges stringent

action to be taken against the use of over the counter OTC medications.

Conclusion

Based on this study, we infer that it is imperative to remove misconceptions among HCPs who will be the primary source of information to laypersons daily. They should be educated regarding antimicrobial resistance and its practice on a clinical basis. Various interventions for the following should be done by including updated guidelines in their medical curriculum and with the help of continuous medical education, various workshops, conferences pointing toward use of antimicrobials, and prevention of its resistance.[32] When it comes to irrational use of antimicrobials in laypersons, some strict interventions should be done such as a ban on the sale of antimicrobials over the counter without proper prescriptions along with educating them with the help of social media, various workshops, and awareness by HCPs during various health camps or their OPD visits.

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Conflicts of interest

There are no conflicts of interest.

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