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Original Article

Antibiotic Use Awareness and Practices in the Indian Community During Later Stages of COVID-19 Pandemic: A Cross-Sectional Survey

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Abstract

Background: An increased overuse of antibiotics coupled with dearth of newer alternatives has worsened antibiotic resistance in LMIC's like India. The prescription of antibiotics for symptoms similar to COVID-19 infection has aggravated the problem of antibiotic overuse, further worsening antibiotic resistance. This study aims at understanding not only the extent of overuse, but also the social patterns and causes of over-prescription or self medication of antibiotics in India. **Methods:** A cross-sectional survey of the knowledge, attitude and practices on antibiotic use was conducted from September to October, 2022, using a Google form questionnaire. A virtual snowball technique was used to recruit respondents. **Results:** A total of 309 responses were received (56% female and 44% male). 59.5% of the respondents were between 15 to 30 years. Surprisingly, in spite of a majority of respondents (around 70%) having a health sciences background, 67.8% of respondents falsely believe that antibiotics speed up recovery from most coughs and colds. 94.8% of respondents had used antibiotics in the last one year. 17.2% of respondents had taken antibiotics without the prescription of a doctor. The most common antibiotic used on prescription and self-medication was Azithromycin. Only 20.7% of respondents took antibiotics on suspicion of having COVID-19, with the most common one being Azithromycin. **Conclusion:** The study highlights that a greater knowledge on antibiotic use does not necessitate better attitude towards their cautious and rational use. The use of antibiotics for self-limiting indications like cough, cold and sore throat needs to be restricted through stricter regulations.

Introduction

Antibiotics have changed the course of medicine. Morbidity and mortality due to previously fatal diseases like pneumonia, tuberculosis and typhoid has been drastically reduced with antibiotic use. It has permitted life-saving invasive procedures with minimal risk of infection. The biggest beneficiaries of antibiotic therapy have been countries with the greatest load of infection, which correspondingly are mostly lower- and middle-income countries (LMIC) like India.[1] With the medical breakthroughs that antibiotics accomplished came the concomitant problem of antibiotic resistance (AMR), which has been expedited by the indiscriminate use of antibiotics. This increased usage of antibiotics coupled with the dearth of newer alternatives has worsened antibiotic resistance.[2-4] High rate of drug resistance was seen in some of the commonest healthcare associated (HAI) and community acquired infections e.g., UTI and pneumonia.[5] Contracting drug resistant bacteria prolongs hospital stays and causes preventable damage: 1.27 million deaths globally were directly attributed to antibiotic resistant infections in 2019.[6]

India has one of the greatest infectious disease burdens in the world as a part of BRICS (Brazil, Russia, India, China and South Africa).[7] India has the highest drug resistance index (DRI) amongst all HIC and LMIC's.[8] Overuse of and hence resistance against first line antibiotics coupled with limited accessibility of costlier second line antibiotics effective against drug resistant microbes is a two-pronged problem for an LMIC like India. An unregulated private sector accounts for 90% of antibiotic sales,[9] leading to the unauthorized sale of antibiotics as over the counter (OTC) drugs in India, despite them being prescription drugs. Certain studies conducting pharmacist interviews reveal commercial interests, poor access to public healthcare, economic and time constraints among consumers, lack of stringent regulations, and scanty inspections as a cause for OTC antibiotic dispensing.[10] The Indian government, taking into account the alarming rise in AMR related mortality and morbidity, launched an Antibiotic Stewardship Program to promote rational antibiotic use.[11] The greatest challenge lies in regulated restrictions on sale of effective antibiotics along with ensuring antibiotic availability for genuine use.

Another factor further worsening overuse in the current era is the prescription of antibiotics for symptoms similar to a COVID-19 infection or even after the diagnosis of COVID-19. Despite instructions from the Indian Council for Medical Research (ICMR) and the World Health Organization (WHO) for use of antibiotics only in cases of secondary bacterial infections in COVID-19 patients,[12] there is evidence to suggest that most patients were

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prophylactically prescribed antibiotics. Even though antibiotic sales in many HIC's during COVID-19 decreased, adult antibiotic doses in India increased.[9] Researchers estimated that COVID-19 likely contributed to 216.4 million excess doses of antibiotics for adults and 38 million excess doses of Azithromycin for adults during a period of peak COVID-19 activity in India.[9]

With greater emphasis on hospital setups in stewardship programs, the contribution of community patterns in antibiotic overuse specifically in India is understudied. The study takes into account the recent Omicron wave in India which may have aggravated overuse due to primarily flu-like symptoms of the infection. Along with irrational prescription of antibiotics during COVID-19, self-medication with antibiotics was also very frequently observed. Hence, it is imperative to study the practices and awareness about antibiotic usage in the Indian community. This study aims at understanding not only the extent of overuse, but also the social patterns and causes of over prescription or self-medication of antibiotics in an LMIC which is the largest consumer of antibiotics, yet, has minimal discourse and data on the same.[13] This study would help inform policy makers regarding factors responsible for antibiotic overuse. It would also help to target relevant social behaviors in awareness programs to curb antibiotic overuse.

Methods

Study Settings and Participants

It is a cross sectional, single center, observational study to assess the pattern of antibiotic use in India, through a self-administered Google form questionnaire. A literature review of research on similar topics which also assessed the awareness and practices on antibiotic use in the community using a questionnaire was done.[14-22] We did not come across any such study that assessed antibiotic use awareness and practices in the community during later stages of the pandemic. Hence, a new questionnaire, influenced by previous similar studies, was created to address the given problem in the Indian scenario. The questionnaire included multiple choice questions, forced choice questions and open-ended questions regarding antibiotic name and dosage. All questions were compulsory. The inclusion criteria for respondents were being citizens of India, of any gender, of age more than or equal to 15 years, literate in the English language and having access to online messaging applications. Respondents who were not citizens of India or were below 15 years of age were excluded from the study. Also, the respondents who were not well versed in the English language and did not have access to online messaging applications were excluded from the study.

Ethical Consideration

Ethical approval (IEC No.: 2022-790) was granted by the Institutional Review Board of the Medical College where the Principal Investigator is studying. The questionnaire began with brief information about the study followed by a consent clause. The respondents were assured that the information provided by them will be kept confidential and will be used for research and academic purposes only. The respondents were directed to the questionnaire only after they provided their consent for participation in the study.

Instrument

The questionnaire was pilot tested on ten medical students as well as ten non health care professionals. To avoid duplication, the questionnaire settings were such that multiple responses from the same email ID could not be submitted. The questionnaire was divided into four sections relating to demographic information and knowledge, practice and attitude of respondents on antibiotic use. The first section consisted of questions on demographic details of participants (name, gender, age, level of education, profession etc.). A question was also included to enquire if the respondents' close family member was a healthcare professional. The second section contained four questions about the respondents' knowledge on the use of antibiotics for conditions like cold and cough where they are commonly used, but not indicated. It also assessed people's awareness on the side effects of antibiotics and antibiotic resistance.

This was followed by a third section pertaining to the practices being followed regarding antibiotic use. Further, subsections were created based on whether the antibiotics used were prescribed by a doctor or self-medication was done. The name and dosage of antibiotic taken was asked. In the sub-section for prescribed antibiotics, a question was included to assess whether culture sensitivity for antibiotic prescription was done. Additionally, the source of information for antibiotics taken through self-medication was asked.

The last section assessed the respondents' attitude towards antibiotic course completion and regulations on the procurement of antibiotics. It also included questions regarding antibiotic use as prophylaxis for suspected COVID-19 cases. Another question assessed whether doctors prescribed antibiotics for COVID-19 positive individuals.

Data Collection

Responses were collected over a period of one month from 20th September to 20th October 2022. Responses were collected by sending online links through WhatsApp messages with the general information about the aim of the study. Virtual snowball technique was used which is a non-probability type of sampling technique. A URL link for the Google form was circulated by participants to other potential respondents, creating a referral chain for recruitment of respondents.

Data Management and Analysis

Descriptive statistics were used to analyze the data. The mean, standard deviation, frequency and percentage were calculated to assess the trends in knowledge and awareness about antibiotic use. Percentage and frequency of demographic details of respondents like gender, age, level of education, profession etc. was calculated. The percentage of true and false responses for

questions under the knowledge section was calculated. The attitude and practices of respondents on antibiotic use were also assessed based on the percentage and frequency of given options selected by the respondents. The generic name of commonly used antibiotics used by the respondents was manually extracted from the responses and the respective frequency and percentage of the commonest antibiotics were calculated. A correlation between positive antibiotic use practices and attitudes with gender as a variable was made by calculating relative percentages. Similarly, correlation between antibiotic use behaviors and whether the respondent had a healthcare professional as a close family member or not as a variable was made.

Results

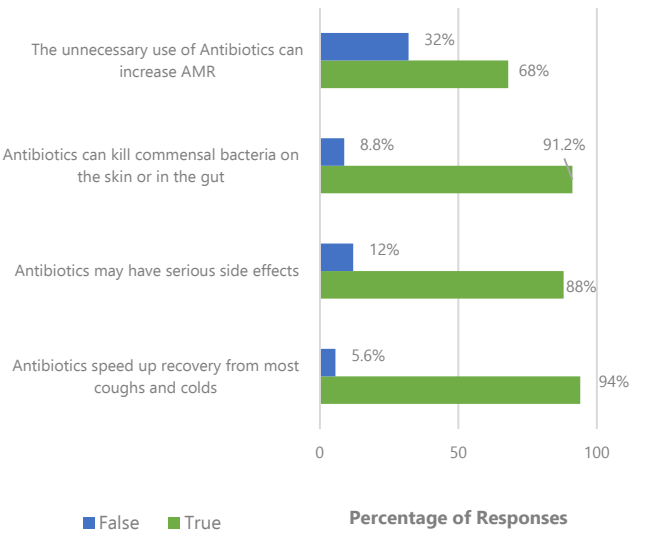
A total number of 309 responses were received. More than half respondents (59.5%, n=184) belonged to the age group of 15 to 30 years. The number of female respondents was 173 (56%) and 136 (44%) were male. The number of respondents having completed 12th grade was 117 (38%) and 113 (36.7%) had completed post-graduation. Two thirds of respondents (66.8%) had a close family member as a healthcare professional *Table 1*.

***Table 1*. Socio-Demographic Characteristics of Respondents.**

Attribute	Frequency (%)
Age (in years)	
15-30	184 (59.5)
31-45	25 (8.1)
46-60	95 (30.7)
>60	5 (1.6)
Gender	
Female	173 (56)
Male	136 (44)
Education level (completed)	
10th Grade	5 (1.6)
12th Grade	117 (38)
Undergraduate	73 (23.7)
Postgraduate	113 (36.7)
Professional field	
Homemaker	31 (10)
Healthcare professional	85 (27.5)
Student (Health Sciences)	132 (42.7)
Student (other than health sciences)	32 (10.4)
Businessperson	29 (9.4)
A close family member as a health professional	
Yes	206 (66.8)
No	103 (33.3)

Knowledge of the respondents was assessed through forced choice true and false statements. Most of respondents (94%, n=292) were aware that the unnecessary use of antibiotics can increase bacterial resistance to antibiotics. 91.2% (282) of respondents knew that antibiotics can kill the bacteria that normally live on the skin and gut and 88% (272) respondents were aware that antibiotics can have serious side effects. Almost a third of the respondents (68%, n=210) held the false notion that antibiotics speed up recovery from cough and cold. Data on the knowledge of respondents regarding antibiotic use is represented in *Figure 1*.

***Figure 1*. Socio-Demographic Characteristics of Respondents.**



Only 39.5% (122) of the respondents used antibiotics once in the last year. The number of respondents who selected fever as one of the reasons for antibiotic use was 134 (43.4%) while 42.1% (130) of respondents used antibiotics for sore throat and cough as well. A majority of respondents (82.8%) took antibiotics on prescription, out of which 68% (174) were prescribed an antibiotic course for 3 to 5 days and 92.6% (237) completed the antibiotic course prescribed. Only 17.2% (53) respondents took antibiotics without prescription, out of which 54.7% (29) took antibiotics from previous experience. The number of respondents who self-medicated with antibiotics for a duration of 3 to 5 days was 66% (35). *Table 2* contains data on the practices of respondents on antibiotic use.

The most commonly prescribed antibiotics by doctors were Azithromycin (31%, n=75), Amoxiclav (14%, n=33), Amoxicillin (12%, n=29) and Ofloxacin (9%, n=22), as shown in *Figure 2*. The most common antibiotics that the respondents self-medicated with were Azithromycin (26%, n=10), Amoxicillin (13%, n=5), Amoxiclav (13%, n=5) and Ofloxacin (10.5%, n=4), as shown in *Figure 3*. The most commonly taken antibiotic for COVID-19 were Azithromycin (64%), followed by Doxycycline (14%), Amoxiclav (4.5%) and Amoxicillin (4.5%), as shown in *Figure 4*.

Regarding completing the antibiotic course even after feeling better, 75.4% (233) respondents agree to this positive antibiotic use attitude. A large number of respondents (87.1%) feel that it is good to be able to procure antibiotics without seeing a doctor. 62.5% (193) respondents prefer taking antibiotics if they have a sore throat or cough for more than a week. More than a third of respondents (79.3%) did not take antibiotics on suspicion of COVID-19 while only 20.7% (64) respondents were prescribed antibiotics after testing positive for COVID-19. Information regarding attitude of respondents on antibiotic use is given in *Table 3*.

***Table 2*. Practices of Respondents Relating to Antibiotic Use.**

Attribute	Frequency (%)
Frequency of antibiotic use in the last year	
Once	122 (39.5)
Twice	98 (31.7)
Three or more times	89 (28.8)
Reason for using antibiotics (more than one option can be selected)	
Fever	134 (43.4)
Sore throat	130 (42.1)
Cough	130 (42.1)
Gastrointestinal infections	119 (38.5)
Cold	112 (36.2)
Runny nose	63 (20.4)
Skin infections	37 (12)
Urinary tract infections	32 (10.4)
Was the dose prescribed by a doctor?	
Yes	256 (82.8)
No	53 (17.2)
If the dose was prescribed by a doctor	
How many days was the antibiotic course prescribed for?	
Three days or less	56 (21.9)
Three to five days	174 (68)
More than five days	26 (10.2)
Did you complete the course prescribed?	
Yes	237 (92.6)
No	19 (7.4)
If self-medication was done	
Source of medication	
Previous experience	29 (54.7)
Consulting with a pharmacist	14 (26.4)
Consulting friends/family members who are not health professionals	08 (15.1)
From the internet	02 (3.8)
How many days did you take antibiotics for, if not prescribed by a doctor?	
1-2 days	17 (32.1)
3-5 days	35 (66)
More than 5 days	1 (1.9)

***Table 3*. Attitude of Respondents Regarding Antibiotic Use.**

Attribute	Frequency (%)
I always complete the course of treatment even if I feel better.	
Agree	233 (75.4)
Disagree	76 (24.6)
It is good to be able to get antibiotics from relatives or friends without having to see a doctor.	
Agree	269 (87.1)
Disagree	40 (12.9)
I prefer to use antibiotics when I have a sore throat/cough for more than a week.	
Agree	193 (62.5)
Disagree	116 (37.5)
Did you take antibiotics on suspicion of COVID-19?	
Yes	64 (20.7)
No	245 (79.3)
Were you prescribed antibiotics by your doctor after testing positive for COVID-19?	
Yes	64 (20.7)
No	93 (30.1)
N/A	152 (49.2)

Figure 2. **Most Commonly Prescribed Antibiotics by Physicians.**

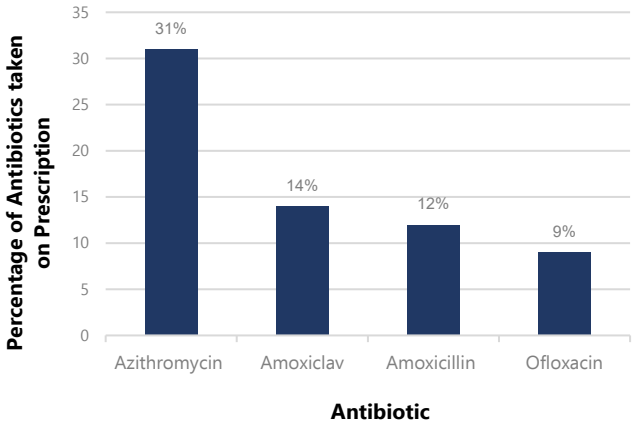


Figure 3. **Most Common Antibiotics Taken as Self Medication.**

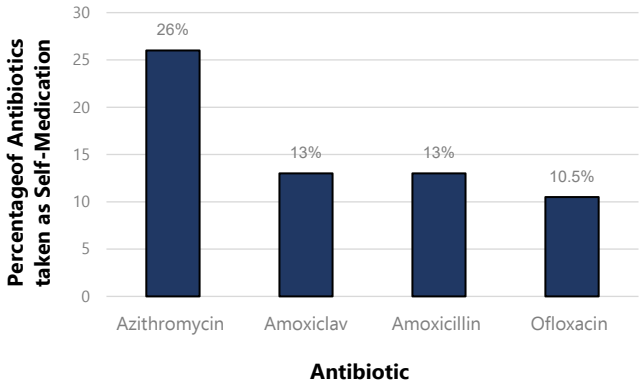
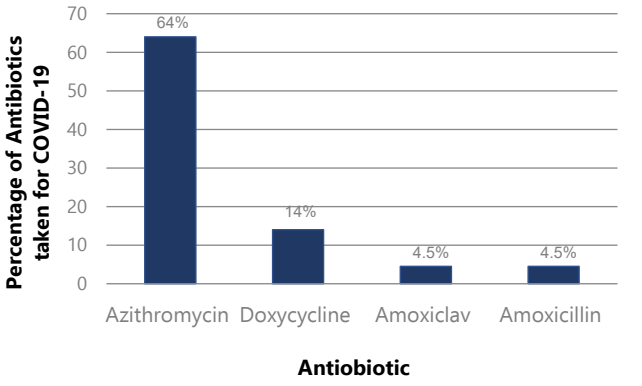


Figure 4. **Most Commonly Taken Antibiotics for COVID-19**



Discussion

The findings of our study reveal critical insights into the awareness and practices related to antibiotic use within the Indian community during the later stages of the COVID-19 pandemic. Despite a substantial proportion of respondents having a health sciences background, there remains a significant gap between knowledge and practice.

Knowledge

Majority of the respondents, being health science students, were aware about the side effects of antibiotics (87.2%) and that antibiotics can kill commensal skin and gut bacteria (90.7%). Awareness about the effect of antibiotics on commensal bacteria was higher than the findings in a similar study in Kuwait.[14] 95.2% of respondents knew about antibiotic resistance, which is higher than the findings in Kuwait,[14] Eritrea,[15] Karnataka,[16] Riyadh,[17] Bangladesh.[18] Various studies with which the comparison is being made were done before the pandemic. The better knowledge on antibiotics in our study can partly also be explained by the fact that during the pandemic, the population at large became more aware about the use of antibiotics due to more health reporting by news and social media platforms, also found by a study in Bangladesh.[18]

Surprisingly, in spite of a majority of respondents (around 70%) having a health sciences background, 67.8% of respondents believe that antibiotics speed up recovery from most coughs and colds, which is a false statement. The frequency of the false notion was even higher than in other similar studies conducted in the general population.[14-17, 19-20] A study in Korea found that physicians and pharmacists may possess more unfounded beliefs on antibiotic efficacy than people not from medical backgrounds.[25]

Comparing the results of our study to a similar one conducted in rural Manguluru[27], a much greater percentage of respondents in our study had knowledge on antibiotic resistance. This can be explained by the fact that most of the respondents from our study had an urban background.

Practice

A large percentage (94.8%) of respondents had used antibiotics in the last one year and more than half of the respondents (60.5%) took antibiotics more than once during the last year. Cough, cold, sore throat, fever and GIT infections were the most common causes for antibiotic use, similar to results in Karnataka,[16] Italy.[20] The highly contagious Omicron variant with primarily flu like symptoms might have contributed to the high antibiotic intake. Only 17.2% of respondents had taken antibiotics without the prescription of a doctor, which is much lower than Kuwait,[14] China,[21] Italy,[20] but similar to Riyadh and Eritrea.[17,15] This might be due to a larger proportion of respondents being health professionals, thus being aware of the positive behavior practice of taking antibiotics on prescription. A high compliance was seen with 92.6% people completing the prescribed antibiotic course, more than in previous studies in the general population in Karnataka,[16] Riyadh,[17] Eritrea[15] and another study on medical students from India.[22] The high compliance in our study may be explained by another study in China which found that students with a medical background had better antibiotic use behaviors.[21] A greater percentage of respondents completed the prescribed antibiotic dose in our study compared to the one conducted in rural Manguluru[27], but the number of respondents taking antibiotics on prescription was comparable.

Attitude

87.1% of respondents felt that it is good to be able to get antibiotics from relatives or friends without having to see a doctor, much greater than what was seen in Kuwait,[14] Karnataka,[16] Riyadh.[17] Majority of respondents prefer to use antibiotics when they have a sore throat/cough for more than a week, higher than in Kuwait,[14] Riyadh.[17] This might be a rational practice, given the higher infectious disease burden in India. In another study in Italy,[20] despite a higher percentage of respondents having correct knowledge about the use of antibiotics in cough and cold, a greater percentage of respondents did use antibiotics for fever, flu and sore throat.

The most commonly used antibiotic, both on prescription and self-medication, was Azithromycin. These results correspond with a recent study where Azithromycin was found to be the most consumed antibiotic in India.[12] Azithromycin has been linked to many side effects and is also included in the watch category of the AWaRe WHO classification of antibiotics.[23,26]

Only 20.7% of respondents took antibiotics on suspicion of having COVID-19, with the most common one being Azithromycin. Only one fifth of respondents reported that a doctor did prescribe antibiotics when they tested positive for COVID-19. This indicates a positive trend of rational antibiotic prescription by doctors during later stages of the pandemic, which could be due to greater awareness about antibiotic misuse during initial stages of COVID-19. Around 75% of COVID-19 positive patients were prescribed antibiotics in the initial stages of the pandemic.[24]

Gender differences were also observed for antibiotic use behaviors in our study. A higher percentage of female respondents (86%) used antibiotics on doctor's prescription than male respondents (77%), contrary to what was found in Karnataka,[16] but similar to Eritrea.[15] 80.3% of women completed the antibiotic course prescribed, compared to 71% of men. 80.3% percent of women completed the course even if they felt better compared to 68.4% of men. Our study found that being female was linked to better antibiotic use practices.

Compared to another study assessing knowledge and practices related to antibiotic use among Indonesian women[28], a greater percentage of female respondents in our study reportedly completed their antibiotic course (80.3%) and also practiced completing their antibiotic course even after they felt better (80.3%). This might also be due to a better level of education and a greater number of respondents overall having a healthcare background in our study.

The study also found that having a healthcare professional as a close family member has a positive influence on antibiotic use practices. 83% of people who had a close family member as a doctor completed their prescription. In comparison, only 64% of people having no close family member as a doctor completed their prescription. A similar study in Italy also found that people having a family member in the health care sector were more likely to correctly know the definition of an antibiotic.[20] On the contrary, a study in China found that university students whose parents had medical backgrounds were more likely to self-medicate with antibiotics.[21]

The findings of this study are limited by the fact that the information is self-reported, thus it may be affected by recall bias of the respondents. The use of a snowball sampling technique, combined with the principal investigator's status as a medical student, resulted in a sample skewed towards young health sciences students, with 66.8% of respondents having a close family member in the healthcare profession. The responses cannot be cross checked for accuracy. The sample population was urban, educated Indian citizens, which is not representative of the Indian population in entirety. As it was a self-administered questionnaire, the respondents could have reported socially desirable behaviors more than the socially undesirable ones India being one of the largest consumers of antibiotics in the world still has little discourse on the community patterns affecting antibiotic use. The novelty of the study lies in the fact that it aims at understanding the contribution of community patterns in antibiotic use behaviors coupled with the effect of the recent pandemic on antibiotic overuse.

Conclusion

The study brings to light trends in the awareness and usage of antibiotics which can have far reaching implications for various stakeholders, namely the patients, doctors and pharmaceutical industry. Public awareness drives to educate people regarding positive antibiotic use behaviors and the threat of antibiotic resistance can be organized under Antibiotic Stewardship Programs.

The study highlights that a greater knowledge on antibiotic use does not necessitate better attitude towards their cautious and rational use, nor does it guarantee a supportive attitude towards regulations on antibiotic dispensing. In spite of its significant cardiovascular adverse drug reactions, Azithromycin was found to be the most commonly used antibiotic in our study. Relatively lower rate of self-medication with antibiotics was seen in our study, which might be due to a greater percentage of respondents with a healthcare background, thus exhibiting positive behavior practices on antibiotic use.

Summary – Accelerating Translation

The biggest beneficiaries of antibiotic therapy have been countries with the greatest load of infection, which correspondingly are mostly lower- and middle-income countries (LMIC) like India. With the medical breakthroughs that antibiotics accomplished came the concomitant problem of antibiotic resistance (AMR), which has been expedited by the indiscriminate use of antibiotics. This increased usage of antibiotics coupled with the dearth of newer alternatives has worsened antibiotic resistance. With greater emphasis on hospital setups in stewardship programs, the contribution of community patterns in antibiotic overuse

specifically in India is understudied. The study takes into account the recent Omicron wave in India which may have aggravated overuse due to primarily flu-like symptoms of the infection. Along with irrational prescription of antibiotics during COVID-19, self-medication with antibiotics was also very frequently observed. Hence, it is imperative to study the practices and awareness about antibiotic usage in the Indian community. This study aims at understanding not only the extent of overuse, but also the social patterns and causes of over prescription or self-medication of antibiotics in an LMIC which is the largest consumer of antibiotics, yet, has minimal discourse and data on the same. This study would help inform policy makers regarding factors responsible for antibiotic overuse, to influence awareness programs so as to target relevant social behaviors to curb antibiotic overuse.

It is a cross sectional, single center, and observational study to assess the pattern of antibiotic use in India, through a self-administered Google form questionnaire. A literature review of research on similar topics was done and the questionnaire was created to fit the scope and aim of the study. Responses were collected over a period of one month from 20th September to 20th October, 2022. Responses were collected by sending online links through WhatsApp messages with the general information about the aim of the study. Virtual snowball technique for data collection was used where the URL link for the Google form was circulated by participants to other potential respondents.

A total of 309 responses were received (56% female and 44% male). 59.5% of the respondents were between 15 to 30 years. A large percentage (94.8%) of respondents had used antibiotics in the last one year and more than half of the respondents (60.5%) took antibiotics more than once during the last year. Cough, cold, sore throat, fever and GIT infections were the most common causes for antibiotic use. The highly contagious Omicron variant with primarily flu like symptoms might have contributed to the high antibiotic intake. Only 17.2% of respondents had taken antibiotics without the prescription of a doctor. This might be due to a larger proportion of respondents being health professionals, thus being aware of the positive behavior practice of taking antibiotics on prescription. A high compliance was seen with 92.6% people completing the prescribed antibiotic course, more than in previous studies in the general population. Surprisingly, in spite of a majority of respondents (around 70%) having a health sciences background, 67.8% of respondents falsely believe that antibiotics speed up recovery from most coughs and colds. The most common antibiotic used on prescription and self-medication was Azithromycin. Only one fifth of respondents took antibiotics on suspicion of having COVID-19, with the most common one being Azithromycin. This indicates a positive trend of rational antibiotic prescription by doctors during later stages of the pandemic, which could be due to greater awareness about antibiotic misuse during initial stages of COVID-19. Around 75% of COVID-19 positive patients were prescribed antibiotics in the initial stages of the pandemic. Gender differences were also observed for antibiotic use behaviors in our study. A higher percentage of female respondents (86%) used antibiotics on doctor's prescription than male respondents (77%). 80.3% of women completed the antibiotic course prescribed, compared to 71% of men. 80.3% percent of women completed the course even if they felt better compared to 68.4% of men. Our study found that being female was linked to better antibiotic use practices. The study also found that having a healthcare professional as a close family member has a positive influence on antibiotic use practices. 83% of people who had a close family member as a doctor completed their prescription compared to 64% of people who had no close family member as a doctor completed their prescription.

The study brings to light trends in the awareness and usage of antibiotics with greater emphasis on the Indian medical community. The findings of this study can be used to formulate a more effective Antibiotic Stewardship Programs to curb antibiotic overuse. The use of antibiotics for self-limiting indications like cough, cold and sore throat needs to be restricted through stricter regulations.

The study highlights that a greater knowledge on antibiotic use does not necessitate better attitude towards their cautious and rational use, nor does it guarantee a supportive attitude towards regulations on antibiotic dispensing. In spite of its significant Cardiovascular Adverse drug reactions, Azithromycin was found to be the most commonly used antibiotic in our study. Relatively lower rate of self-medication with antibiotics was seen in our study, which might be due to a greater percentage of respondents with a healthcare background, thus exhibiting positive behavior practices on antibiotic use.

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Author Contributions

Conceptualization: HG, Methodology: HG, Validation: KG, Formal Analysis: HG, Data Curation: HG, Writing-Original Draft: HG, Writing-Review & Editing: KG, Supervision: KG.

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