

# Knowledge, attitude and practice regarding antibiotic use and antimicrobial resistance among the rural public in Mangaluru, India



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## Abstract

**Introduction:** India is a leading consumer of antibiotics; rational use of antibiotics is of prime importance.

**Objectives:** The majority of the population in India resides in rural areas; hence this study was conducted to capture their knowledge, attitude and practice regarding antibiotic use and antimicrobial resistance.

**Patients and Methods:** A cross-sectional questionnaire-based survey was conducted among 130 randomly selected general public of rural Mangaluru. Descriptive analysis and Pearson's chi-square were employed in data analysis.

**Results:** Adequate knowledge was observed only in 18.5% of the participants. Around 30.8% of participants thought antibiotics killed all germs while 23.8% were of no opinion. Furthermore, 60.8% thought that antibiotics speed up recovery from flu. Only about 23% thought frequent use of antibiotics would make the bacteria stronger and ineffective in the future. A minimal of 16.2% knew that antibiotic resistance is a global problem. About 52.3% preferred to take an antibiotic whenever they had the flu. However, 47% wanted to take it after doctors' consultation. The study showed that compliance to complete the course was better when a doctor explained the proper use of the prescribed antibiotic. Additionally 31.5% opted for self-medication using the previous prescription and 21.5% took the antibiotics suggested by anyone other than the doctor.

**Conclusion:** The study findings help re-evaluate the current public awareness activity and provide insight into some of the areas required to be focused on and aid the adequate legislative changes for a better outcome.

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## Introduction

Alexander Fleming, whose discovery of penicillin started the era of modern antibiotics, also predicted that misuse of antibiotics could develop resistance(1). The World Health Organization (WHO) currently projects 700 deaths per day and predicts that by 2050, antimicrobial resistance alone will cause nearly ten million deaths, a number far more significant than that for cancer (2). India remains the world's largest consumer of antibiotics amongst BRICS countries (Brazil, Russia, India, China and South Africa) (3), with per capita usage increasing by 37% in the last decade (4).

The indiscriminate use of antibiotics in human and veterinary medicine and food production and the release of antibiotics into the environment have led to the emergence of antibiotic-resistant bacteria and genes (5). Additionally, antimicrobial resistance is propagated by the irrational use

## Key point

Adequate knowledge, good attitude and practices among the public is crucial for combating antibiotic misuse and antimicrobial resistance. This questionnaire-based cross-sectional survey brought to light the deficiency in the knowledge of the rural public regarding the proper use of antibiotics and its impact on antimicrobial resistance as a global burden.

of antibiotics by healthcare practitioners and the uninformed public (6).

Currently, not much is known about the knowledge of antibiotic use by the common people in India and globally. Antibiotic resistance occurs worldwide and can affect anyone, of any age, in any country. Though antibiotic resistance occurs naturally, the misuse of antibiotics in humans and animals is hastening the process (1). Therefore, this study aims to find out the knowledge among the general public regarding antimicrobial resistance and the use of antibiotics, their

attitude and practice. This information will bring to the attention of the policymakers and reemphasise the need to have programs to improve public awareness regarding antibiotic use.

### Objectives

- To assess the knowledge regarding antibiotic use and antimicrobial resistance among the people of Rural Mangaluru.
- To determine the attitude of the rural people on the usage of antibiotics.
- To analyse their practice in utilising antibiotics.

### Patients and Methods

#### Study design

A cross-sectional questionnaire-based survey was conducted among the general public of Rural Mangaluru between March 2019 and May 2019.

The sample size was calculated using the formula;

$$N = \left( \frac{Z_{1-\alpha/2}}{E} \right)^2 \times P \times Q$$

N is the number of participants.

Where anticipated P=0.25, Q=0.75,  $\alpha$ =5%, E (Precision) =10%

Here, on the substitution of the values, the required number of respondents is taken as 75. About 130 participants who consented to be a part of the study were informed about the design and purpose of the study. The response of the participants was kept confidential throughout the study.

Data was collected using a structured, guided, interview-based questionnaire consisting of closed and open-ended questions. The researcher was present during the survey to answer the queries raised by respondents.

The questionnaire was designed and validated in three languages (English, Kannada and Malayalam). The questionnaire consisted of two parts:

Part A. Demographic details consisting of age, address, gender, and education.

Part B. Structured questionnaire consisted of items further divided into three sections: knowledge, attitude and practice of antibiotic use and antimicrobial resistance. The knowledge section consisted of nine questions, followed by five questions about attitude and four questions in the practice section. The first question in the practice section had five sub-questions. Two questions in the practice section were open-ended and all the remaining questions of the questionnaire were close-ended type.

**Inclusion criteria:** (a) Participants of the study included families under Grama Kshema. (b) Age of the participant greater than 18 years of age.

**Exclusion criteria:** Age of the participant greater than 60 years of age.

### Statistical analysis

The data collected were recorded and imported into an MS Excel master sheet. Data obtained were tabulated and analyzed using MS Excel and SPSS version 22. Categorical data were presented as frequency and percentage. Qualitative variables were analyzed using Pearson's chi-square, and a P value of <0.01 was considered significant.

### Results

A total of 130 participants of rural Mangalore responded. The dataset consisted of respondents with a mean age of 37.09 years and male and female individuals in equal numbers. The study participants were grouped into five categories based on their educational qualifications. Graduate and above (6.92%), intermediate (18.46%), high school (31.5%), middle school (34.6%), primary school and below (8.46%). Concerning the age group, the participants were divided into three subsets; <30 years (34.6%), 30-45 years (39.2%) and >45 years (26.1%).

### Knowledge

Tables 1 and 2 summarises the knowledge, attitude and practice of respondents regarding antibiotic use and antimicrobial resistance. Out of the 130 respondents, adequate knowledge was observed only in 18.5%. The proportion of subjects having adequate knowledge among the different age groups or gender were almost similar. Graduate and above had the highest score (44.4%) among the educational groups and those with primary school and below had the lowest score (9.1%).

Regarding the responses to the questions as in Table 2, 45.4% knew that antibiotics are ineffective against all germs; however, 60.8% still thought that antibiotics speed up recovery from most coughs and colds. Around 21.5% did not know and 20% denied that antibiotics could destroy commensals within the body.

Accordingly, 74.6% believed that antibiotics should be stopped for signs of adverse effects. Only 23.1% knew that effectiveness of antibiotics decreases when taken often.

Questions regarding knowledge on antimicrobial resistance received minor positive responses. Besides 78.5% were unaware that the decreasing effectiveness of antibiotics is a severe problem worldwide. Only 23.8% knew unnecessary use of antibiotics could make the bacteria resistant, out of which 45.45% had either intermediate qualification or were graduates. In addition, 55.4% of the population were unaware of this. Only 20 participants (15.4%) knew that use of antibiotics in animals could build up resistance rest either disagreed or majorly were unaware (73.8%).

### Attitude

On assessing the participant's attitude towards antibiotic usage (Table 1), 50% of the participants had the right attitude. About 30-45 years age group participants had a slightly better attitude (54.9%) when compared to others.

**Table 1.** Response to the knowledge, attitude and practice of respondent groups

Groups	Total 100%	Knowledge		Attitude		Practice	
		Adequate	Not adequate	Good	Poor	Satisfactory	Unsatisfactory
<b>Age (year)</b>							
<30	45	9 (20%)	36 (80%)	22 (48.8%)	23 (51.1%)	36 (80%)	9 (20%)
30-45	51	8 (15.7%)	43 (84.3%)	28 (54.9%)	23 (45.1%)	39 (76.5%)	12 (23.5%)
>45	34	7 (20.6%)	27 (79.4%)	15 (44.1%)	19 (55.9%)	29 (85.3%)	5 (14.7%)
Total	130	24 (18.5%)	106 (81.5%)	65 (50%)	65 (50%)	104 (80%)	26 (20%)
<b>Gender</b>							
Female	65	11 (16.9%)	54 (83.1%)	31 (47.7%)	34 (52.3%)	53 (81.5%)	12 (18.5%)
Male	65	13 (20%)	52 (80%)	34 (52.3%)	31 (47.7%)	51 (78.5%)	14 (21.5%)
Total	130	24 (18.5%)	106 (81.5%)	65 (50%)	65 (50%)	104 (80%)	26 (20%)
<b>Education</b>							
Graduate and above	9	4 (44.4%)	5 (55.6%)	7 (77.8%)	2 (22.2%)	5 (55.6%)	4 (44.4%)
Intermediate	24	5 (20.8%)	19 (79.1%)	14 (58.3%)	10 (41.7%)	20 (83.3%)	4 (16.7%)
High school	41	8 (19.5%)	33 (80.5%)	20 (48.8%)	21 (51.2%)	37 (90.2%)	4 (9.8%)
Middle school	45	6 (13.3%)	39 (86.7%)	26 (57.8%)	19 (42.2%)	35 (77.8%)	10 (22.2%)
Primary school and below	11	1 (9.1%)	10 (90.9%)	3 (27.3%)	8 (72.7%)	7 (63.6%)	4 (36.4%)
Total	130	24 (18.5%)	106 (81.5%)	65 (50%)	65 (50%)	104 (80%)	26 (20%)

Similarly, males showed a little better attitude, 52.3%, than females (47.7%). Accordingly 77.8% of graduates had a good attitude, and the least was observed in participants with primary and below levels of education (27.3%).

Table 2 shows that 68 (52.3%) preferred to take antibiotics every time there was a fever or sore throat. This group consists of 22.22% graduates and 45.45% who had primary education.

Likewise, 39.2% believed that antibiotics could be taken without consulting a doctor and 13.8% were neutral.

Besides 54.6% were against the idea that the antibiotics course can be stopped if relief is felt after taking the initial few doses. Moreover, 29.2% preferred to keep antibiotics readily available for future use and 13% did not have an opinion about this.

Overall, only 26.9% believed that every time a course of antibiotics is taken, it makes these medications ineffective. The remaining 74 (56.92%) of the individuals did not agree with this statement or were of no opinion.

### Practice

Antibiotic usage practices were quite good among the respondents (Table 1). Among 130 participants, 71 had at least taken a single course of antibiotics within the last three months. Out of this highest percentage of consumers of antibiotics were the two extreme groups of literacy. This includes 66.66% of graduates and above and 81.18% of the primary school and below.

Table 2 shows that 31.50% of the total participants have taken antibiotics used before and 30% have given antibiotics to someone else for use. Also, 21.50% have taken medicines suggested by someone other than a doctor. This list includes pharmacists, friends, family and other healthcare professionals. Furthermore, 58 out of 71 had taken antibiotics with a doctor's prescription; 78.87%

of those who had taken antibiotics said that doctor had clearly explained to them how to take antibiotics. An equal percentage of participants declared that they understood what the doctor had explained. Forty out of the 71 (56.34%) have not completed the entire course of medication.

Table 3 shows a higher number of participants whom the doctor appropriately explained regarding the use of antibiotics had completed the course of antibiotics, which was statistically significant with a *P* value <0.01.

### Discussion

Due to the higher number of infectious diseases in developing countries like India, antibiotics are widespread in use. However, because of the relaxed laws in India and other developing countries, it is not difficult to obtain antibiotics without prescription (over-the-counter drugs), and hence, antibiotic abuse by the public is expected (4).

This study gives insight into the knowledge, attitude and practice of antibiotic use and antimicrobial resistance among the rural public. The results on the respondent's knowledge clearly show a low level of understanding. Adequate knowledge was found on an average of 18.5%, and right attitude was 50%. A similar study conducted in Maharashtra observed good knowledge in 7.7% of participants and the right attitude in 11% (6). Similarly, a study conducted among the public of Kuwait showed 46% poor knowledge (7).

On comparing the results of respondents, graduates and above performed better than other literacy groups. In our study, even though the average of correct responses to questions in the attitude section came out to be 50%, only three among 130 participants gave the correct answers to all questions, out of which two of them were graduates (6).

Furthermore 30.8% believed that antibiotics are effective against all germs. In a study conducted in Nepal, 94.1%

**Table 2.** Participants' responses to the knowledge, attitude, and practice questions

Question		Responses (%)		
		Yes	No	Don't know
<b>Knowledge</b>				
K1	Antibiotics are effective against all germs.	30.8	45.4	23.8
K2	Antibiotics can kill the bacteria that are usually present in our body	58.5	20	21.5
K3	Antibiotics speed up recovery from most of the cough and cold.	60.8	20.8	18.5
K4	Should stop taking antibiotics as soon as possible if you get any side effects	74.6	16.2	9.2
K5	When taken often, antibiotics are less likely to work in future.	23.1	41.5	35.4
K6	Any medication with a red line on its strip should be consumed only with a doctor's prescription	40.8	25.4	33.8
K7	Unnecessary use of antibiotics can make the bacteria stronger against it.	23.8	20.8	55.4
K8	Use of antibiotics among animals can reduce the effect of antibiotics among humans	15.4	10.8	73.8
K9	Decreasing effectiveness of antimicrobial drugs is a serious problem worldwide	16.2	5.4	78.5
		<b>Agree</b>	<b>Disagree</b>	<b>Neutral</b>
<b>Attitude</b>				
A1	Preference to take an antibiotic every time there is a fever or sore throat	52.3	34.6	13.1
A2	It is all right to take antibiotics without consulting a doctor	39.2	47	13.8
A3	If relief is felt after a few days of antibiotic use, can stop taking the entire course	27.7	54.6	17.7
A4	Prefer to keep antibiotics readily available at home for future use.	29.2	60.8	10
A5	Every time I use antibiotics, I may contribute to making the antibiotics ineffective.	26.9	43.1	30
		<b>Yes</b>	<b>No</b>	
<b>Practice</b>				
P1	Any course of antibiotics taken within three months	54.60	45.40	
	Whether it was prescribed by a doctor	81.69	18.31	
	Doctor explained in detail how antibiotics should be used	78.87	21.13	
	Understood properly what the doctor explained	78.87	21.13	
	Entire course of drugs was completed	43.66	56.34	
P2	Reuse the previously prescribed antibiotics later.	31.50	68.50	
P3	Ever given antibiotics that you have used to someone else.	30	70	
P4	Taken antibiotics suggested by anyone other than a doctor.	21.50	78.50	

**Table 3.** Doctor's explanation vers antibiotic course completion

Question		Did you complete the entire course of drugs?			P value
		No	Yes	Total	
Did the doctor explain in detail how antibiotics should be used?	No	15	0	15	<0.01
	Yes	25	31	56	
	Total	40	31	71	

answered that “antibiotics are useful for killing germs” (8). A similar study in India showed that 45.9% thought antibiotics could be used for any microbial infection (9). Al-Shibani et al in Saudi Arabia found that their participants were confused about the use of antibiotics for either bacteria or virus since only 38% understood that antibiotics were used for bacterial infection only (10).

Similarly 60.80% of the participants believed that antibiotics speed up the recovery from most cough and colds, and 52.3% preferred to take antibiotics every time there was a fever or sore throat. A study on consumers' attitudes and use of antibiotics states that 32% believed that taking antibiotics when they had flu like symptoms them recover more quickly (11). These findings agree with several recent reports from India (9) and western

countries (12).

Accurate knowledge regarding bacterial and viral diseases is essential for the public in this era as there is a rising rate of numerous outbreaks each year within the country. Knowing about the cause of the disease will contribute to the right attitude and actions that need to be taken. It will improve the response towards different ailments, take adequate prophylaxis and be more careful in taking treatment and completing the prescribed course of medication on time.

In our study, 59.2% of individuals thought the red line on the medicine strip or package had no purpose. In a study post ‘red line’ initiative, 63% of participants were unaware that the red line indicated prescription drugs (6).

About 39.2% of participants from our study felt that it is

all right to take antibiotics without a doctor's prescription. Previous studies have shown that the prevalence of self-medication is 37% in the urban population and 17% in a rural population in India (13), whereas 12.7-95% in other developing countries (14,15). In our study, 31.50% of the participants relied on previous prescriptions for future use. As per the study conducted by Arrais et al, previous physicians' prescriptions are significant for self-medication information (16). Since physicians are not available in time in some rural areas; this might have tempted the rural population to use the initial doctor's prescription for self-medication (17).

From the present study results, 18.41% of those who had taken a course of antibiotics within the last three months did not take the doctor's advice. In addition, 30% of the respondents had given the medicines they used to someone else and 21.50% had taken drugs suggested by someone other than doctors. In another study conducted in Kuwait, over half of the respondents who have taken antibiotics did not have a doctor's prescription (7). This discrepancy in percentage response can be due to better trust in doctors by patients in rural parts of our country.

Besides, 27.7% of the respondents believed that if relief is felt within a few days of antibiotic use, then the entire course of drugs need not be completed. Accordingly 17.7% did not have any response in this regard. Also, from the practice section, we found out that 56.33% of the participants have not completed the entire course of antibiotics that they have taken within the last three months. One of the survey highlights for India from the 2015 WHO multi-country survey was that only 58% know that they should stop taking antibiotics only when they finish the course as directed (18).

Questions based on antimicrobial resistance were the least answered. The majority of the participants were unaware of the ineffectiveness of antibiotics on repeated usage. In a similar study conducted by Agarwal et al, the authors reported poor knowledge regarding antibiotic resistance. Only 15.5% of their study participants knew the term "antimicrobial resistance" (9).

## Conclusion

The present findings would be the first step in providing a baseline quantitative data of patterns of antibiotic use, knowledge and attitudes regarding antibiotics among the families of rural Mangalore.

On assessing the data, the average of adequate knowledge was relatively poor with slightly higher participants with the right attitude. However, serious issues like the irrational use of antibiotics for any cold or flu must be discouraged and impressed upon the common public, as this remains one of the leading causes of increasing antimicrobial resistance.

When compared based on educational qualification, graduates and above performed better than others in knowledge, attitude and practice, which implies that

the literacy status of the participants should be given importance and knowledge and good practices should be conveyed to the public accordingly in a tailored manner.

This study brings to light the higher percentage of self-medication, obtaining an antibiotic without a prescription or an old prescription. These practices need to be corrected. One of the leading reasons for such practice is the easy availability of over-the-counter antibiotics. A strict legislative rule and citizen education is the need of the hour.

The necessity of completing the entire course of antibiotics and consulting a doctor before taking medication should also be emphasised. Furthermore, proper instructions regarding antibiotic use should be given to patients by the doctor as this has proven to be the most effective tool to maintain a high degree of compliance, probably due to the trust in the doctor by the rural people.

The knowledge regarding antimicrobial resistance is abysmal among the public. Until they realise the gravity of the problem in terms of the effect of antimicrobial resistance on their health and economy, tackling this global problem will be a failed attempt. Adequate legislative changes and re-investment of law are required for a better outcome.

## Limitations of the study

A larger sample size would have been better to provide a more generalizable result.

## Authors' contribution

AK: Conceptualization, design, supervision, manuscript preparation. RH: Data analysis, statistical analysis. MMM: Literature search, investigation and original draft writing. SA: Literature search, Writing including reviewing and editing.

## Conflicts of interest

There is no conflicts of interests.

## Ethical issues

The study was conducted after obtaining clearance from the Institutional Ethics Committee of KS Hegde Medical Academy under Nitte (Deemed to be University), India. The data collection tools were pre-validated and approved by the ethics committee. Written informed consent was obtained from all the participants in their local language, and the responses were kept confidential. Besides, ethical issues (including plagiarism, data fabrication, double publication) have been completely observed by the authors.

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