IOSR Journal of Pharmacy
(e)-ISSN: 2250-3013, (p)-ISSN: 2319-4219
Volume 16, Issue I (January 2026), PP. 12-18
www.iosrphr.org

Public's Perception Knowledge, Attitude and Behaviour on Antibiotic Resistance – A survey in Bangalore City, India

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Abstract:
This study was designed to assess the general public's perception, knowledge, attitude and behaviour on antibiotic resistance in a Bangalore, a metropolitan city in the south of India. It also tries to decipher whether the level of education and the professional status of an individual has a positive association with the level of knowledge on antibiotic resistance.Of all the participants who participated in the study, around 95.5% of the surveyed population received a university education. About 81.6% of the participants had knowledge about antibiotic resistance and 82.2% of them believed that many bacterial infections are becoming increasingly resistant to treatment with antibiotics. 65.4% of the respondents believed that antibiotic resistance is becoming one of the biggest problems the world faces and about half the participants believed that they are not at risk of getting antibiotic resistance infection, as long as they finish the entire course. 40.7% of respondents were of the belief that antibiotic use is appropriate in case of a viral flu or cold. With regards to the public's behavioural attitude towards practice of antibiotics, the results showed that 33.5% of the respondents have previously used antibiotics without an appropriate prescription by a doctor. Only 7.6% of the responders often did not complete their antibiotic course and 14.8% patients shared their antibiotics with a sick family member. During emergencies, 31.2% of the surveyed public used their personal stored stock of antibiotics and used it for a similar illness. Also, 31% of the participants in the study have previously asked for antibiotics during their visit to a doctor, nurse or pharmacist.
The implications of the important problem of antibiotic resistance are far-reaching and ardent efforts are required immediately to curb its further development. This requires the hands-on involvement of the government, health department, hospitals, healthcare providers & patients. It therefore becomes necessary to gauge the public's level of awareness about the importance of the issue and their attitudes toward it. Only then can we device methods to tackle the problem, implications and the various ways in which they can combat it. In our study, it is evident that patients from bigger cities who have access to education and resources are more knowledgeable with regards to the problem of antibiotic resistance. On a systemic level, various strategies must be formulated by the government and its concerning healthcare distribution bodies. On the ground level, healthcare workers must remain educated about the latest guidelines for treatment of these illnesses. Moreover, improving their communication between them and their patients on effective ways to use antibiotics is imperative and will be central to controlling the development this rapidly emerging and dangerous phenomenon of antibiotic resistance.
Key-words: Antibiotic resistance, Drugs, Internal Medicine

I. INTRODUCTION

Antimicrobial resistance is considered an extremely serious and ever-increasing public health threat as its rise is currently faster compared to the development of new drugs(1). Multi-drug resistant bugs pose enormous challenges such as longer hospital stays, treatment failures, higher mortality rate, and an increased economic burden. Excessive and incorrect use of antibiotics can cause a rise in selective pressure that favours the emergence, multiplication and spread of resistant strains(2). In addition to this, the transmission of resistant organisms between humans in healthcare facilities and in communities contribute to the occurrence and spread of the antibiotic resistance. Moreover, common infections have become very difficult to treat. Therefore, the World Health Report 2007 emphasised the matter of antibiotic resistance as one of the major threats to public health security in this century(3).

It is known that antibiotic resistance is not an important priority in most developing and many developed countries. The irrational use of antibiotics results not only results in the unfolding of resistant bacterial strains but also becomes an economic overload on the national health system. To acknowledge this issue, the theme of World Health Day in 2011 was 'Antimicrobial Resistance: no action today, no cure tomorrow' and a recent report by WHO about antibiotic resistance, discloses that this serious threat is no longer a forecast of the future, it is happening currently in every part of the world and has the capability to affect anyone, of any age, in any country(4).

From the perspective of healthcare professionals, it roots from repetitive and inappropriate prescriptions of antibiotics. Whereas in patients, it is most likely due to the lack of knowledge regarding the appropriate use of antibiotics, purchasing over-the-counter antibiotics, not completing the full course of treatment through self-medication, sharing medication with other people and keeping part of a treatment course for another occasion(5). Other reasons for antibiotic resistance may include the use of antibiotics in the food production chain and also within the animal production sector.

The awareness on its solemnity and importance is the first step towards reducing its progress. Various approaches have been taken worldwide and one such approach was taken during the general meeting of the World Health Assembly in 2015, where an action plan was formulated to help solve the rising problem of antibiotic resistance. In this action plan, one of the objectives were to amplify public knowledge on antibiotic resistance through successful communication, education and training. Various educative campaigns were held which provided technical and informative messages that focused on encouraging responsible use of antibiotics, information regarding misuse of antibiotics and why resistance to antibiotics are critical public health problems(6).

In a developing country like India, owing to its large and diverse population, customising educational interventions so as to curb the rise of antibiotic resistance demands the understanding of the public's knowledge regarding antibiotic resistance, their practise towards antibiotic usage and their behavioural attitude which acts as prospective factor for development of antibiotic resistance. Thus, the current study is aimed at assessing the public's knowledge and behaviour towards the correct use of antibiotics among the residents of Bangalore, Karnataka, India by using a close ended questionnaire. Once the severity and causes of the issue are recognised, awareness programs can be developed to control antibiotic abuse. This helps in planning necessary preventive measures with the intention to help future generations.

II. METHOD

Patients above the age of 18 years from Bangalore, Karnataka participated in the online survey, which was circulated among a diverse population. All the patients participated in the study on voluntary basis and were true to their knowledge while answering the following survey. A total of 445 patients on both sexes (259 females and 186 males) participated in this survey. Every patient enrolled in the survey, conducted in line with the World Medical Association Declaration of Helsinki, was given an elaborate written description of the proposed study and consent for participation was obtained. A typed closed ended questionnaire, in English was circulated among all the patients.

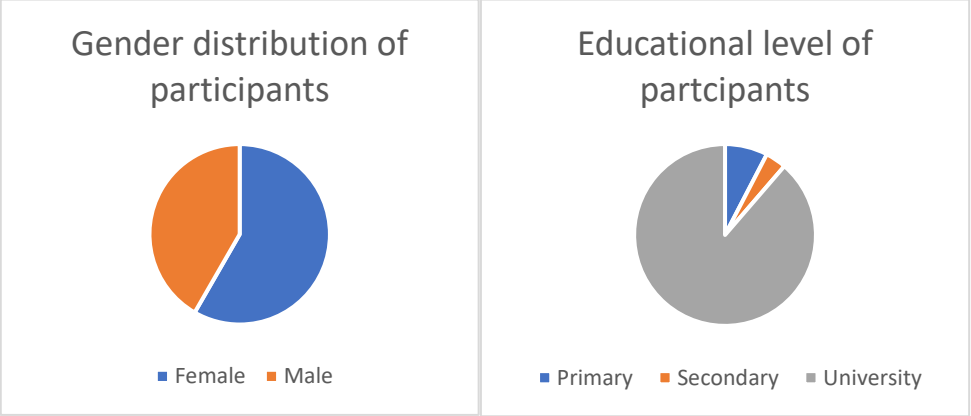
The study was conducted by two examiners and complete anonymity of all the data collected was maintained. A well-constructed questionnaire containing 12 questions were prepared. Phase validation of the questionnaire was performed by the subject experts and the final questionnaire was developed on agreement of all of them. 6 questions were set to assess the patient's awareness about antibiotic resistance and its threat to public health. Another 6 questions were set to assess the behavioural attitude of the patient which can be a contributing factor to antibiotic resistance.

Statistical Analysis

The completed questionnaires were collected and evaluated from the participants. Selected answers for each question were arranged categorically on an excel sheet and the results were subjected for statistical analysis. The descriptive analysis of data was performed on the basis of mean and median values.

III. RESULTS

A total of 500 questionnaires were circulated among the general public above the age of 18 years, out of which 445 patients completed the questionnaire and the response rate was 89%. Among all the participants, males accounted for 41.6% (186/445) and females accounted for 58.2% (259/445). Education level of the participants varied from high school or lower (4.5%, 20/445)) to university education (95.5%, 425/445).



Questions set to assess patient's awareness regarding antibiotic usage and antibiotic resistance (table 1)

Of all the patients who took part in the study, 81.6% (363/445) reported that they had heard about antimicrobial resistance. 12.6% (56/445) patients were not aware about the seriousness of antimicrobial resistance while 5.8% (36/445) patients did not know about the phenomenon.
82.2% (366/445) of all the patients believed that many bacterial infections are becoming increasingly resistant to treatment with antibiotics. Whereas 4.3% (19/445) of the patients did not believe so and 13.5% (60/445) did not know much about the subject.
65.4% (291/445) of patients believed that antibiotic resistance is one of the biggest problems the world faces today while 12.1% (54/445) of the patients do not. 22.5% (100/445) did not know whether they agreed or not with the statement.
49.9% (222/445) patients believed that they are not at risk of getting antibiotic resistant infections if they take their antibiotics correctly. 19.6% (87/445) of patients believed that completion of the antibiotic regime did not make a difference to the development of antibiotic resistance. 30.6% (136/445) of the patients were not aware of it played a role or not.
40.7% (181/445) patients believed that antibiotics make one recover faster when having a cold or flu. 44.5% (198/445) of the patients did not believe that antibiotics are helpful in treating cold or flu. 14.8% (66/445) of the patients were not aware of the effect antibiotics have in treating cold or flu.
93.9% (418/445) patients agreed that the body can usually fight mild infections on its own without antibiotics. 3.1% (14/445) of the patients believed that antibiotics are necessary to fight even mild infections and 3% (13/445) were not aware about it.

Questions	Response	Frequency	Percentage
Some of the medicines that used to work in the past for fighting bacterial infections are no longer working. This problem is called drug resistance(antimicrobial resistance). Have you ever heard of this problem?	Don't Know	36	5.8%
	No	56	12.6%
	Yes	363	81.6%
Do you believe that many bacterial infections are becoming increasingly resistant to treatment with antibiotics?	Don't Know	60	13.5%
	No	19	4.3%
	Yes	366	82.2%
Do you believe that antibiotic resistance is one of the biggest problems the world faces?	Don't Know	100	22.5%
	No	54	12.1%
	Yes	291	65.4%
I am not at risk of getting antibiotic resistant infection, as long as I take my antibiotics correctly	Don't Know	136	30.6%
	No	87	19.6%
	Yes	222	49.9%
Antibiotics make one recover faster when having cold or flu	Don't Know	66	14.8%
	No	198	44.5%
	Yes	181	40.7%
The body can usually fight mild infections on its own without antibiotics	Don't Know	13	3%
	No	14	3.1%
	Yes	418	93.9%

Questions which are set to assess and evaluate a patient's behavioural attitude which can potentially lead to antibiotic resistance.

Of all the participants who took part in the study, 33.5% (149/445) patients revealed that they have previously used antibiotics without the prescription of the doctor. 65.4% (291/445) of the patients denied using antibiotics without a doctor's prescription and 1.1% (5/445) of the patients do not know if they have or haven't previously used antibiotics without the doctor's prescription.

15.7% (70/445) patients believed that 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. 77% (344/445) of the patients did not agree with its use in this manner while 7% (41/445) of the patients were not aware of the consequences of using antibiotics from friends and family without the doctor's prescription.

7.6% (34/445) patients say that they stop taking prescribed antibiotics once they start feeling better symptomatically. 86.3% (384/445) of the patients mention that they completed the full regimen prescribed by the doctor, even if they feel better. 6.1% (27/445) of the patients are unaware if they have completed the whole course of medication.

14.8% (66/445) patients revealed that they have shared their antibiotics with family members who are sick. 83.1% (370/445) of the patients do not share their antibiotics with sick family members and 2.1% (9/445) do not know if they have indulged in such practises before.

31.2% (139/445) of the patients keep a stock of antibiotics at home and use it without checking its expiry date during emergencies. 67.4% (300/445) of the patients discard the leftover antibiotics and do not keep any stock of antibiotics at home. 1.4% (6/445) do not know if they have indulged in storing old antibiotic medicines at home.

31% (138/445) of the patients have previously asked for antibiotics during their visit to a doctor, nurse or pharmacist. 67.9% (302/445) of the patients have never asked their doctors for antibiotics and 1.1% (5/445) of the patients are not aware if they have previously asked a doctor for antibiotics.

Questions	Response	Frequency	Percentage
Have you previously used antibiotics without the prescription of the doctor?	Don't Know	5	1.1%
	No	291	65.4%
	Yes	149	33.5%
Its okay to use antibiotics that were given to a friend or family member, as long as they were used to treat the same illness	Don't Know	41	7%
	No	344	77%
	Yes	70	15.7%
If one feels better after only partially completing an antibiotic course, one can terminate the therapy immediately	Don't Know	27	6.1%
	No	384	86.3%
	Yes	34	7.6%
If anyone of your family members are sick, do you usually give them the same antibiotics which were prescribed to you?	Don't Know	9	2.1%
	No	370	83.1%
	Yes	66	14.8%
Do you normally keep stock of antibiotics at home for emergency use?	Don't Know	6	1.4%
	No	300	67.4%
	Yes	139	31.2%
Have you ever asked for antibiotics during your visit to a doctor, nurse, or pharmacist?	Don't Know	5	1.1%
	No	302	67.9%
	Yes	138	31%

IV. DISCUSSION

One of the world's most critical public health problems is antibiotic resistance. Persistent rise in resistant strains of bacteria has resulted in a decreased responsiveness to antibiotic treatment. The lack of awareness regarding the different adverse effects of antibiotic misuse and/or abuse among the population in developing countries such as India can increase this threat to level of even higher significance(7). Therefore, it becomes necessary to control the spread of antibiotic resistance by first, understanding the general public's level of awareness on the subject and then their attitudes towards it. This can be followed by educating them and promoting appropriate antibiotic use.

In the metropolitan city of Bangalore, a high percentage (81.6%) of people who participated in the study were found to be aware of the concept of antibiotic resistance. This is in contrast to a rural setting, such as Davengere, where 74.4% of the patients had no knowledge about antibiotic resistance. These variations may be attributed to their level of education and standard of living, which seemed to be higher in the city of Bangalore. Therefore, it can be inferred that the level of education plays a role in the public's awareness on antibiotic resistance.

When a person consumes antibiotics, sensitive bacteria are killed while resistant strains may be left behind, causing them to eventually grow and multiply. These antibiotic-resistant strains can spread among family members and the community, thereby threatening the environment with a new strain of the infectious disease. Viable treatment options for these bacteria are often expensive to treat and difficult to cure. The extent of knowledge about the adverse effects of antibiotic resistance was found to be 82.2% among the patients of the present study. On the contrary, a study done by Ankit et al(8) in the town of Davanagere showed only 25% of the patients had knowledge about the adverse effects of antibiotic resistance. Such unawareness and erroneous beliefs could be a potential danger to public health.

The absence of awareness regarding the consequences of antibiotic abuse and misuse, over the counter availability of antibiotics without the doctor's prescription and self-medication further increases the threat caused by antibiotic resistance. In the survey, 65.4% of patients agreed that usage of antibiotics without the doctor's prescription or by any other means is harmful. Similar percentage of awareness (71.4%) was found in the study done in Davangere and among the students of Portugal (70%)(9). 33.5% i.e 145 participants of 445 or of the patients believe that self-medication, taking medication on advice of a medical shopkeeper or relatives or by the influence of advertisements are not harmful. A similar trend can be noted in Jordan(10), where over 51.8% of the participants in that survey were found to use antibiotics on advice of their family members or relatives.

Another contributor to the misuse of antibiotics and consequent development of antibiotic resistance is the lack of knowledge on the diseases that can or cannot be treated with antibiotics. The survey showed, worryingly, that about 40.7% of the participants across the various gender, age, educational status and profession were of the belief that antibiotics make one recuperate faster when having a cold or flu.

Also, over 138 of the 445 participants (31%) have asked for antibiotics during their visit to a doctor, nurse or pharmacist. A large section of participants in the survey (67.9%) have shown trust in doctors for not prescribing antibiotics, similar to a study done in Sweden (87%). In contrast, 74.4% of respondents in a small town of Davanagere expected their doctor to prescribe antibiotics for their illness. These results prove the importance of education and indicate the need for educational interventions to create awareness among patients.

From this study, approximately 31.4% of the participants still believe that antibiotics can be saved for personal use and that it is a good habit to acquire antibiotics from relatives without a prior workup by a physician. Numerous studies have confirmed that keeping leftover antibiotics reduces compliance with antibiotic therapy, and contributes to antibiotic resistance. According to the results of this survey, 86.3% of the participants agreed that when one does not complete the entire antibiotic course due to symptomatic recovery, surviving bacteria can rapidly multiply which may lead to antibiotic resistance. As stated by the WHO, when a patient terminates the antibiotics regimen earlier than scheduled, it favours the bacteria strains that have some natural intrinsic resistance. It is therefore recommended that patients always complete the entire course of antibiotics prescribed to them by a medically certified health professional. Secondly, there are chances that leftover antibiotics may not be the correct drug for new infections as different infections require different antibiotics. Thirdly, to treat any infection, one may require a sufficient amount of drug for a specific duration. Hence, if people consume leftover antibiotics, it may not affect the correct bacteria, the dose and dosage may be incorrect and the duration of treatment may be insufficient. Therefore, it is necessary for the general public to be educated and made aware on the fact that the potency of an antibiotic can be preserved only when the full course is completed and a valid prescription has been provided by a healthcare professional. To decrease the problem of antibiotic resistance, appropriate usage of antibiotics must be conveyed by healthcare providers to the patients through effective communication. Moreover, there is a need for ardent laws in the country which

would the curb the ability of patients to have access to antibiotics over the counter in pharmacies, without a valid doctor's prescription.

The general public's perception on conditions that require antibiotic therapy, various ways to obtain antibiotics, and their compliance to the prescribed treatment plan are necessary to manage antibiotic resistance. Knowledge and beliefs are often proportional to patients' behaviour and attitude. We can enhance appropriate usage of antibiotics by providing adequate knowledge to the general public. The Centres for Disease Control and Prevention issued certain guidelines and information under the heading of 'mission critical: preventing antibiotic resistance'. They have stressed on various steps to prevent antibiotic resistance. They have recommended the completion of prescribed antibiotic course with the recommended dosage schedule, discarding leftover medication, refrain from sharing or use of leftover antibiotics, complete the entire treatment prescribed, prevent asking healthcare workers for antibiotics and they recommend good hand hygiene as well as primary prevention through vaccines.

The various ways to circulate the CDC guidelines among the general public are ; 1) Advertisements on social media platforms, prior to movies, television and newspapers 2) Publication of educational literatures on mass media sources 3) Distribution of pamphlets along with antibiotics which contain educational information on antibiotic resistance 4) Educational programs should be included in the curriculum of the schools and colleges to create awareness among the youth and correct their misconceptions. By motivating patients and modifying their behavioural attitude and practice towards antibiotics, healthcare professionals can play a vital role in reducing antibiotic resistance. We can also aim at reducing antibiotic prescription rates and drug expenditure in developing countries like India by educating people about the appropriate use of these drugs.

Adequate efforts from both doctors as well as the patients are necessary to prevent the loss of antibiotic usage in the future. Strict rules should be placed for the usage of antibiotics, constant hunt for newer antibiotics and frequent up- gradation of doctor's & patients' knowledge is necessary to fight antibiotic resistance. Updating treatment guidelines and ensuring adequate antibiotic stewardship in hospitals is a necessary step required for best medical practice.

V. CONCLUSION

The implications of the important problem of antibiotic resistance are far-reaching and ardent efforts are required immediately to curb its further development. This requires the hands-on involvement of the government, health department, hospitals, healthcare providers & patients. It therefore becomes necessary to gauge the public's level of awareness about the importance of the issue and their attitudes toward it. Only then can we device methods to tackle the problem, implications and the various ways in which they can combat it. In our study, it is evident that patients from bigger cities who have access to education and resources are more knowledgeable with regards to the problem of antibiotic resistance. On a systemic level, various strategies must be formulated by the government and it's concerning healthcare distribution bodies. On the ground level, healthcare workers must remain educated about the latest guidelines for treatment of these illnesses. Moreover, improving their communication between them and their patients on effective ways to use antibiotics is imperative and will be central to controlling the development this rapidly emerging and dangerous phenomenon of antibiotic resistance.

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