Original Article

ANTIMICROBIAL USE AND RESISTANCE: SURVEY OF KNOWLEDGE AND AWARENESS OF GENERAL PUBLIC IN CHITTOOR DISTRICT

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ABSTRACT

Objective: Antimicrobial resistance (AMR) leads to increased morbidity and mortality. WHO identified AMR as great threat to human health. India with highest bacterial disease burden in the world has rampant antibiotic usage. Natural phenomenon AMR is accelerated by the misuse and overuse of antibiotics. The responsibility of proper usage lies with both the prescribers and general public. Ecological, epidemiological, cultural and socioeconomic factors influence AMR. This study aims to enhance understanding of current public awareness and common behaviors related to antimicrobials, their use and AMR.

Methods: Descriptive closed-questionnaire-based face-to-face survey was conducted between January to March 2022 among 400 attendants of patients visiting the tertiary care hospital at Tirupati, Chittoor District. Residents aged>18 y were included; health care providers excluded. Data was collected using WHO questionnaire consisting of two parts.

Results: There is widespread antibiotic usage-70% of participants used at least once in past 6 mo. Many respondents were mistaken that head ache (42%) and cold (38%) require antibiotics. Only 66% of respondents knew to take full course of antibiotics. 26% of respondents never heard of antibiotic resistance terminology. 51% of participants had no idea that antibiotic-resistant bacteria can spread among persons. All the respondents agreed that regular hand washing is helpful.

Conclusion: Huge knowledge gaps were found along with various misconceptions and misunderstandings in the public. It is imperative to address these gaps as soon as possible to save the potency of available antibiotics. Reasons for misconceptions and ways to dispel them need further studies.

Keywords: Antimicrobial resistance, Antibiotic usage, Drug resistance, Multidrug resistance

INTRODUCTION

Alarming increase in antimicrobial resistance (AMR) all over the world is compromising the treatment of infectious diseases and undermining other advances achieved in health and medicine [1]. It leads to longer hospital stays, higher medical costs and increased mortality. The World Health Organization thus identified antimicrobial resistance as one of the three greatest threats to human health [2]. It is one of the major public health problems, not just an infectious disease issue. In India, having the highest bacterial disease burden in the world, antibiotic usage is rampant [3].

Antimicrobial resistance, a natural phenomenon is being accelerated by the misuse and overuse of antibiotics in humans and animals. The factors that influence the spread of resistance are multifaceted such as ecological, epidemiological, cultural, social and economic [4] An increase in resistant organisms coupled with a big fall in the number of new antimicrobial drugs suggests a looming apocalyptic scenario [5]. Therefore, there is a need to maintain effectiveness of available antimicrobials. The responsibility of proper usage of antimicrobials lies not only with the prescribers but also with the general public and in particular to the consumers.

For understanding the emergence and spread of AMR and judicious use of antibiotics, it is important to undertake both forms of surveillance–antimicrobial use and resistance. At present, relatively little is known about the general public's knowledge of antibiotic resistance at a global and country level.

The aim of this survey is to collect information from the general public regarding antimicrobial use and AMR including self-reported use of antimicrobials, attitude and practice on antimicrobials use; and awareness of antimicrobial resistance problem. It provides a snapshot of the current situation which will assist with efforts to track the impact of awareness-raising efforts across the world.

MATERIALS AND METHODS

Study design: Descriptive closed-questionnaire based face to face survey

Study setting: Subject recruitment will be done in Amara Hospital, Tirupati, Chittoor district, South India. The hospital is situated in Tirupati town of Andhra Pradesh. It is a 100 bedded multi-super specialty hospital.

Study duration: Survey was conducted between January 2022 and March 2022.

Study population: Attendants of out-patients visiting Amara hospital.

Inclusion criteria:

• Age>18 y

• Residents of Chittoor district

Exclusion criteria:

• Language barrier

• People who are doctors or nurses by profession

Sample size

The population of Chittoor district is taken as infinite. For a population proportion of 50%, at confidence level of 95% with a confidence interval of 5, the sample size is 385 approximated to 400.

$$\text{Sample size (n)} = \frac{Z^2 \times P \times (1\text{-}P)}{C^2} = 385 \simeq 400$$

Where, n = sample size

Z = 1.96 for 95% confidence interval

P = Population proportion (0.5)

C = Confidence interval expressed as decimal (0.05)

Methodology

Data collection procedure: Subjects were enrolled after informed verbal consent process during a regular three-month hospital visit by the principal investigator (PI). Data was collected in the form of a closed questionnaire methodology, which consists of two sub parts. Part 1 elicits demographic data for the purpose of profiling. Part 2, comprising 14 questions, assesses the subject under three key areas: self-reported use of antibiotics, knowledge of antibiotics and knowledge of antibiotic resistance. The questionnaire used by WHO team for the multi-country public awareness survey will be used with local adaptation (vide annexure). A structured trilingual (Telugu, Tamil and English) questionnaire was designed.

Data entry and analysis

- Data was entered and recorded in Microsoft excel 2010.

- Descriptive statistics such as percentages will be used to describe answers obtained for each response asked in a question.

- Data will be statistically analyzed using SPSS version 20 (IBM Inc., SPSS Inc., Chicago, IL, USA) software and results will be presented through suitable tables and graphs.

Ethical considerations

Ethical committee approval has been obtained. The study subjects were explained the purpose of the study and assured confidentiality.

RESULTS

Sociodemographic details

Attendants of out-patients attending the Amara hospital between January to March 2022 meeting inclusion criteria were randomly surveyed. Among the 403 study participants, 201(49.9%) were male and 203(50.1%) were female. Majority of them belonged to the middle age group (20.8%); very few of them were above 65 y (6.2%). Their age distribution is depicted in a bar graph in the following fig. 1.
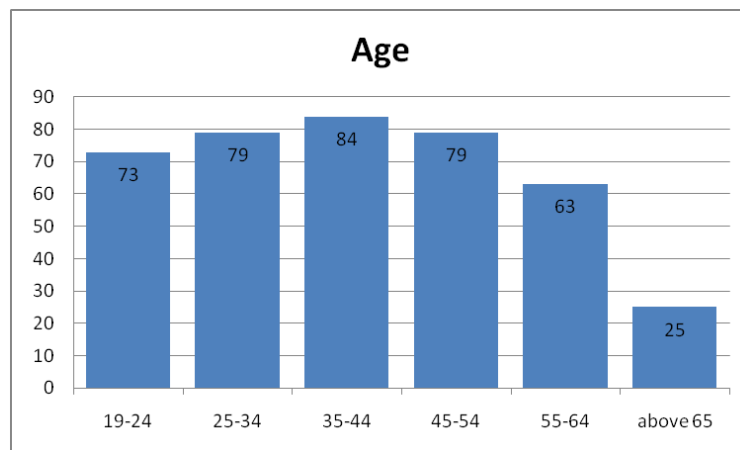

Fig. 1: Bar graph depicting age distribution of study participants, when the residence localities of study participants were studied, 169 (42.25%) were from suburban parts, 151 (37.75%) were from rural areas and 83 (20.75%) were from urban parts
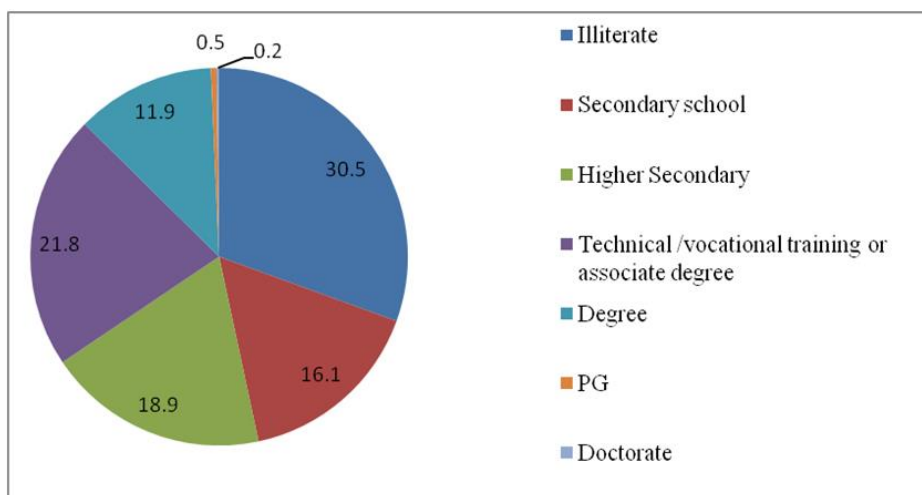

Fig. 2: Pie diagram showing percentage of study participants with their educational qualification

Socioeconomic status of participants was assessed using BG Prasad's classification. Majority of them fell under the upper middle-class category (53.3%) followed by middle class (30.3%), upper class (11.9%) and lower middle class (4.5%) in that order. Details of the household composition are given in a table below (table 1). Nearly 3/5th of the participant's household (58.8%) did not have children.

Table 1: Household composition of the study participants

S. No.	Household composition details	Frequency	Percent
1.	Single adult only	8	2
2.	Married/domestic partnership-adults only	131	32.5
3.	Married/domestic partnership and at least 1 child under 16	113	28
4.	Multiple adults aged above 16 and at least 1 child under 16	51	12.7
5.	Multiple adults aged above 16 only	100	24.8
6.	Total	403	100

Main questionnaire

Use of antibiotics

The majority of respondents surveyed report having taken antibiotics within the past six months (70%), including more than one-third having taken them within the past month (30%). Overall, the vast majority of respondents (91%) report that they got their antibiotics (or a prescription for them) from a doctor or nurse. The respondents also said they had received advice from a medical professional on how to take the antibiotics they last took (85%).
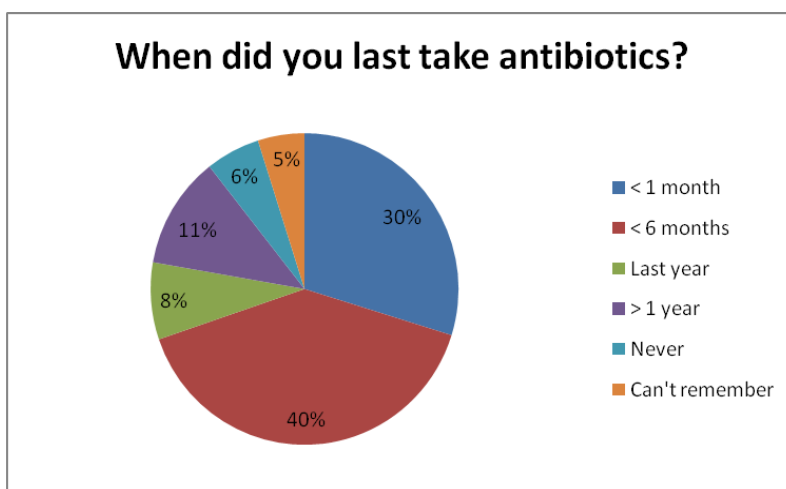

Fig. 3: Pie diagram showing percentage of responses to "when did you last take antibiotics?"

Knowledge of antibiotics

Participants were first asked whether they thought the following statement was true or false: "It's okay to use antibiotics that were given to a friend or family member, as long as they were used to treat the same illness"

Overall, 21.5% of the survey respondents think this is true, whereas it is in fact a false statement. Participants from rural areas were more likely to think this statement to be true when compared to suburban and urban residents, at 56.3%, 29.8% and 13.7%, respectively.

The next statement asked was: "It's okay to buy the same antibiotics or request these from a doctor if you're sick and they helped you get better when you had the same symptoms before." For this false statement, 57.8% felt it is true and 42.2% felt it is false. Age group-wise response to this question is represented in fig. 4.
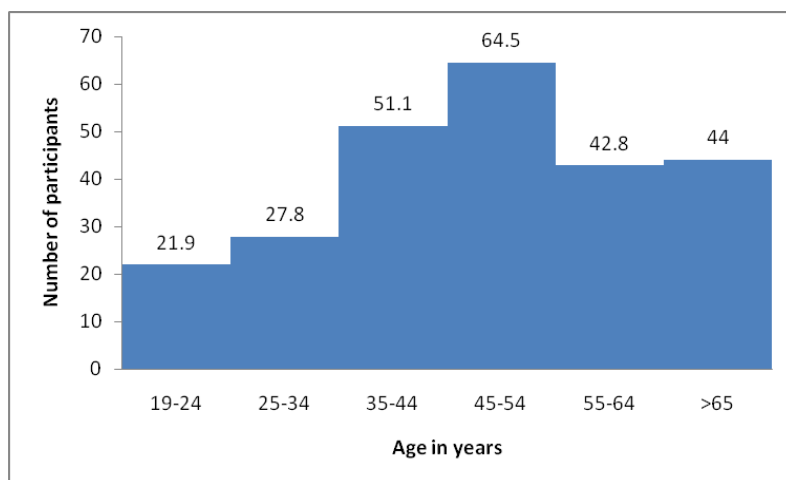

Fig. 4: Percentage of responses of various age groups to "It's okay to buy the same antibiotics, or request these from a doctor, if you're sick and they helped you get better when you had the same symptoms before"

It was then asked when they thought they should stop taking antibiotics once they had begun treatment: when they feel better, or when they have taken all the antibiotics as directed. According to WHO, patients should always take the full prescription, even if they feel better, before completing the whole course. The majority of respondents surveyed answered that the full course of antibiotics should be taken as directed (66%).

Respondents were provided a list of medical conditions and asked which among them can be treated with antibiotics. The list contained conditions that can be treated with antibiotics (such as bladder/urinary tract infection (UTI), skin/wound infection) as well as those that cannot (headache, cold and flu). Majority of participants

rightly identified infections requiring antibiotics like UTI (85%), skin and wound infection (78%). Many respondents were mistaken that headache (42%) and cold (38%) can be treated with antibiotics. These are usually viral infections which do not require antibiotic usage.

Older respondents aged 35 and above were more likely to give the correct answer. Urban respondents are more likely to respond correctly, with 93% thinking that UTIs can be treated with antibiotics compared to 78% of those in suburban areas and 69% of rural respondents. Respondents who are more educated are more likely to respond correctly, with 74% of those with higher education identifying UTIs as being treatable with antibiotics, compared to 63% of those with no education.
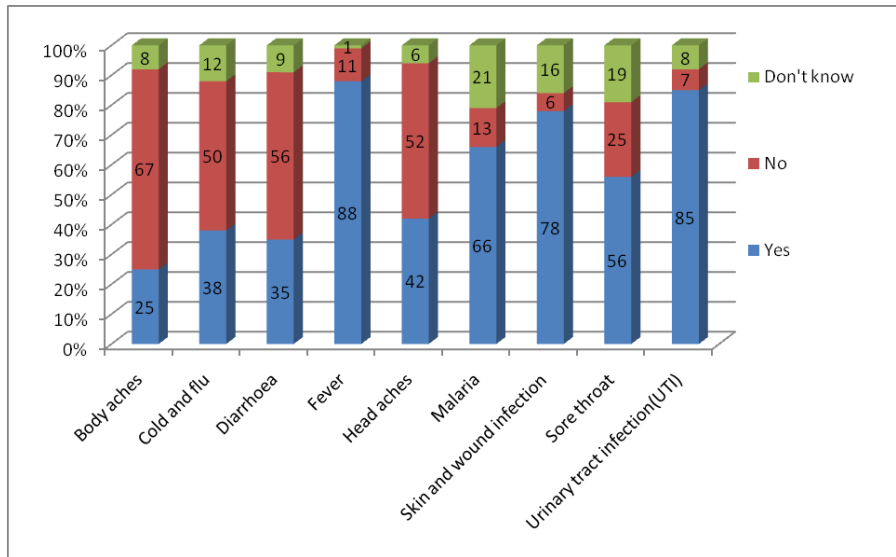

Fig. 5: Percentage of responses from respondents to "Do you think these conditions can be treated with antibiotics?"

Knowledge of antibiotic resistance

The last part of survey poses questions to understand the level of knowledge of participants with regard to antibiotic resistance terminology, level of understanding the issue and possible ways to prevent it.

A few terms were given in the questionnaire and respondents were asked if they have ever heard of them. The responses are depicted in the fig. below. The percentage of participants who have never heard of any of those terms is 26%.

Those who stated they were aware of the term antibiotic resistance were asked from which sources they had heard about it. The source cited by the largest number of respondents surveyed is media (39%), followed by family member or friend (11%), and then a doctor or nurse (8%).

The respondents were presented with a list of statements and asked whether they were true or false. The results are represented in fig. 7.
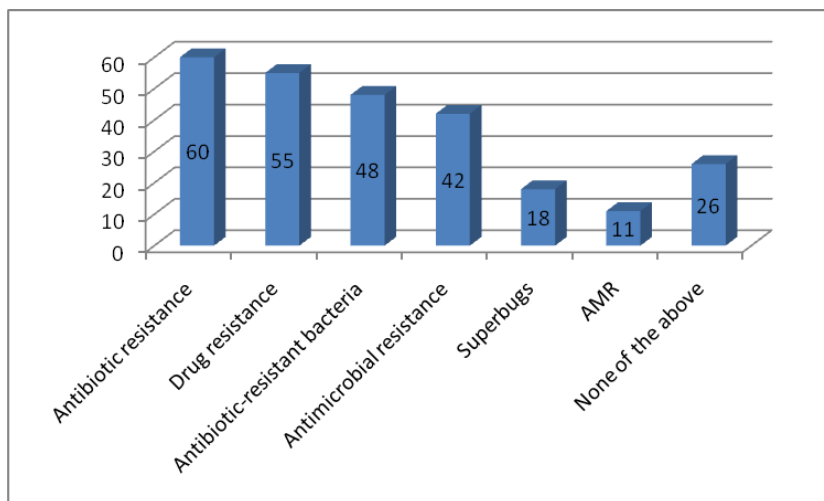

Fig. 6: Percentage of participants who answered "Yes" to the antimicrobial resistance terminology
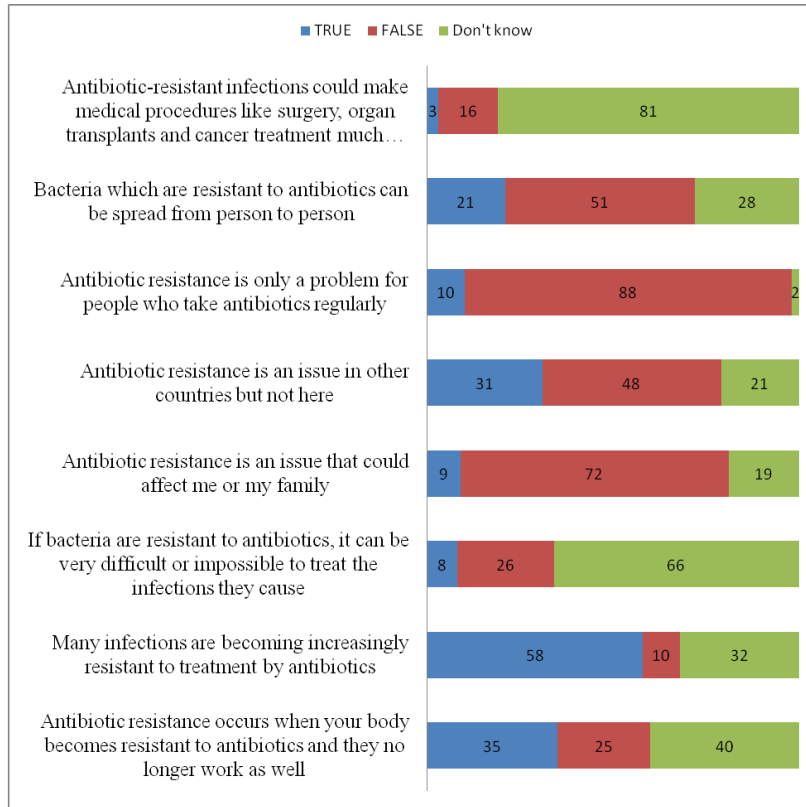
Fig. 7: Percentage of responses from all respondents to statements designed to determine knowledge of antibiotic resistance, majority of respondents were not able to correctly identify these statements as represented in fig. 7

In order to explore levels of awareness and understanding around ways to address the problem of antibiotic resistance, respondents were asked whether they felt the following actions mentioned in fig. 8 would help address the problem.

All the participants agreed that people should wash their hands frequently and get their children vaccinated. Majority of participants

(95%) strongly agreed that antibiotics should only be used when they are prescribed. Percentage yes responses to other statements are depicted in the following fig. 8.

The next part of survey further assessed people's opinions on the scale of the problem of antibiotic resistance and whether it will impact them personally by the statements in fig. 9.
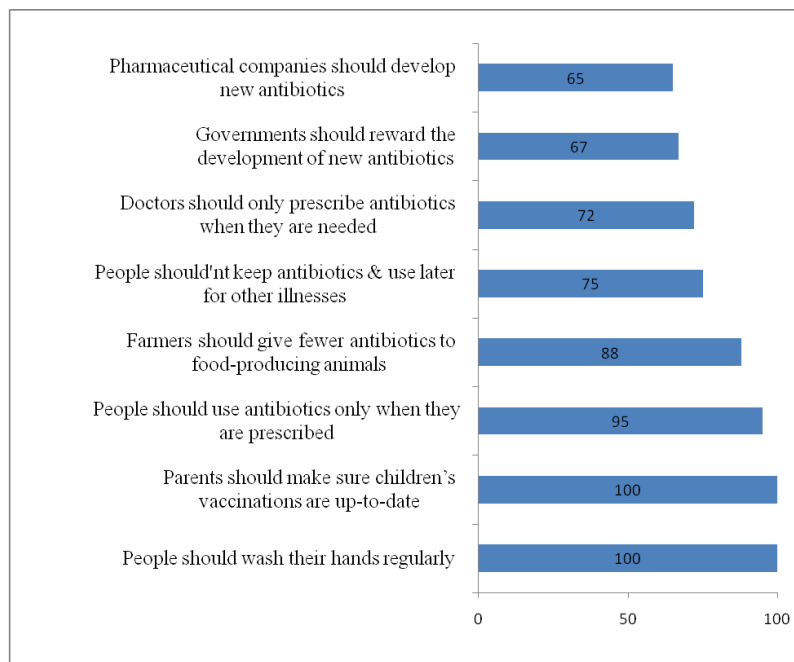

Fig. 8: Percentages of all respondents who answered "yes" to "Do you think the following actions would help address the problem of antibiotic resistance?"
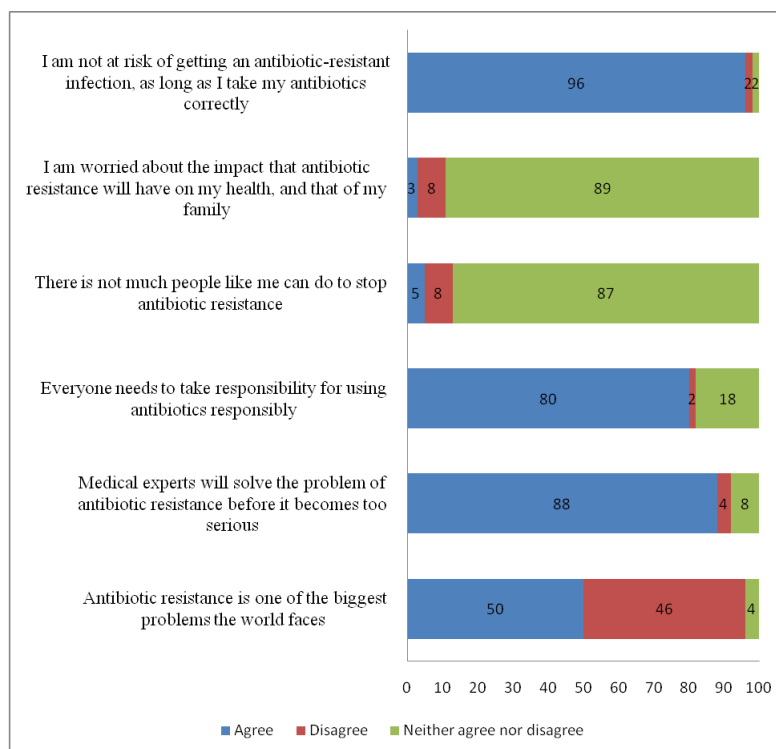
Fig. 9: Percentage of responses to statements surrounding measures to stop/prevent antibiotic resistance

There are misconceptions like "I am not at risk of getting antibiotic-resistant infections as long as I take my antibiotics correctly." Majority participants feel that medical experts will solve this resistance problem before it becomes too serious. Nearly half of them do not recognize Antibiotic resistance as one of the major problems the world is facing right now. Percentage of responses to statements surrounding measures to stop/prevent antibiotic resistance is represented in fig. 9.

Antibiotics in agriculture

To assess knowledge in this area, survey participants were asked whether they thought that antibiotics are widely used in agriculture. The majority of respondents (74%) think that antibiotics are widely used in agriculture, including animal husbandry.

DISCUSSION

This survey provides answers to various questions assessing the knowledge of antibiotic usage, antibiotic resistance and its patterns among residents of Chittoor district, South India. A total of 403 participants were included in the study and answered a structured questionnaire approved by WHO to assess knowledge and awareness of antibiotic usage and resistance.

Antibiotic resistance is a worldwide problem concerning not just the Infectious disease specialists but everyone. The natural phenomenon of antibiotic resistance is being accelerated by inappropriate use, over usage and misuse of antibiotics. With emerging reports of multi-drug resistant (MDR), extensively-drug resistant (XDR) and pan-drug isolates (PDR) worldwide, not many new antibiotics in pipeline, we are about to face an apocalyptic scenario. Antibiotic resistance is now a public health problem and hence needs involvement of society at various levels to limit the spread and reduce the impact of resistance. As responsible citizen, one can help achieve this through good hygiene and vaccination, only using antibiotics when prescribed by a certified health professional, taking the full course, and never sharing or using left-over antibiotics.

Thus it becomes critical for people to understand what proper usage of antibiotics is, what antibiotic resistance means, how grave the problem is and what they can do to change it. In relation to this, the results of this survey show there is much to be done. The results show that people recognize that there is a problem, but they do not fully understand what causes it, or what they can do about it.

Antibiotic use

The questions in this section concentrate on when was the last time antibiotics were taken, whether they were prescribed or not, whether usage instructions were delivered or not.

About one-third (30%) participants surveyed have taken antibiotics in last one month and this percentage shot up to 70% when antibiotic intake in last 6 mo was taken into account. This high prevalence of antibiotic usage has high impact on antibiotic resistance. High levels of use contribute to the problem, and it affects high number of people if these antibiotics become ineffective. It, therefore, sets the context for the rest of the findings.

Overall, the vast majority of respondents (91%) report that they got their antibiotics (or a prescription for them) from a doctor or nurse. The respondents also said they had received advice from a medical professional on how to take the antibiotics they last took (85%). These numbers suggest we are dealing better with appropriate usage of antibiotics. These results were comparable to the results of WHO multi-country resistance survey [1].

Knowledge about antibiotics

Questions in this section tried to know about correct usage of antibiotics and whether the person knows which conditions require antibiotic treatment and which conditions do not. There were true or false statements which tested knowledge regarding reusing antibiotic used for the same illness before and medicines used for same illness by friends/family members.

The results indicate high levels of misunderstanding. A quarter of respondents felt 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. More than half of them felt it is okay to buy the same antibiotics, which helped them get better when they had the same symptoms before. Taking antibiotics that were prescribed for someone else can contribute to their inappropriate use. The antibiotics may not necessarily be right for the friend or family member's particular illness; they may not have taken in the right

dose or for the correct duration. It also means that the person they were prescribed to did not complete the entire course of treatment. Ideally antibiotic prescription should be done by doctors after prior examination and testing as necessary.

Duration of treatment plays an important role in antibiotic resistance development. Around one-third participants (33%) felt they can stop antibiotics once they feel better. This is an alarming number and people need to be educated about the importance of sticking to antibiotic course.

Understanding which conditions can be treated with antibiotics is also important, as the use of antibiotics for conditions which are not treatable with them is another contributor to misuse. Respondents were asked to indicate which of a list of medical conditions could be treated with antibiotics—the list included both conditions that can and cannot be treated with antibiotics. The results indicate widespread misunderstanding in this aspect. Though majority rightly identified UTI (85%), skin and soft tissue infections (78%) as requiring antibiotics, they failed to identify sore throat (56%), cold and flu (38%) as viral infections not requiring antibiotics.

Young respondents and those from rural areas were identified to have major misconceptions in this regard. Action that improves understanding of how and when to take antibiotics what should they be used for seems to be critical.

Knowledge about antibiotic resistance

This section tried to find out if the person is familiar with antibiotic resistance terminology like AMR, superbugs etc. There were few true or false statements regarding antibiotic resistance. Antibiotic resistance (60%) and drug resistance (55%) seem to be the most familiar terms; superbugs (18%) and AMR (11%) the least familiar. More than a quarter (26%) of respondents has never heard of any of these terms.

Those who were aware of any or all of the terms were asked where they had heard the term. The most common source was 'Media', suggesting that media has an important role in building awareness around this issue. Medical professionals help can also be sought in this regard as well as in appropriate prescribing of antibiotics.

Not just awareness, but understanding of the issue is also important to tackle the scenario in an appropriate way. The survey sought to establish levels of understanding by asking respondents to indicate whether a series of statements around antibiotic use were true or false. Large knowledge gaps and high levels of misunderstanding were noted in this area also. Encouragingly, public has understood the importance of hand washing (100%) and vaccination (100%), probably due to COVID-19 pandemic.

Understanding the issue of antibiotic resistance

This part of the questionnaire comprised of question related to basics and mechanisms of antibiotic resistance spread and ways to prevent them. Notable is the fact that 96% of respondents believe they are not at risk of an antibiotic-resistant infection as long as they take their antibiotics correctly, which is not in fact the case. This number was 63% in the Antibiotic Resistance: Multi-country public awareness survey by WHO [1]. Antibiotic-resistant bacteria can spread from person to person, with the potential to affect anyone, of any age, in any country.

Also notable is the fact that 87% neither agree nor disagree with the statement: *There is not much people like me can do to stop antibiotic resistance.* Similarly, 89% do not know the impact of antibiotic resistance on their health. This is concerning, as addressing the problem of antibiotic resistance in fact requires action from everyone, from members of the public and policymakers to health and agricultural professionals. An overwhelming 88% of public feel that medical professionals will solve this problem before it becomes too serious, which is not the actual case.

LIMITATIONS OF THE STUDY

The data was collected from a limited pool of population and hence not representative of national data. Closed-question quantitative research methodologies limit the extent to which a researcher can probe into respondents' answers to explore levels of understanding. There is a chance of bias of giving the expected answers as the research method includes a questionnaire survey.

Knowing the consequences of antibiotic resistance and everyone's role in preventing it, it is imperative that enough knowledge is imparted to public in this regard.

CONCLUSION

With this survey of general public we tried to assess the knowledge, attitude and practices of antibiotic usage and awareness of antimicrobial resistance. Huge gaps were found along with various misconceptions and misunderstandings with respect to antibiotic usage and resistance in the public. It is imperative to address these gaps as soon as possible to save the potency of available antibiotics. This study helps to track the effectiveness of various awareness campaigns going on at national and international levels.

The results reported here will inform future engagement efforts to ensure campaigns targeting the public to address key gaps in knowledge and correct common misunderstandings of this population. Further studies are needed to understand in depth reasons for lack of awareness and ways which can effectively close these knowledge gaps and dispel prevailing misconceptions.

FUNDING

Nil

AUTHORS CONTRIBUTIONS

All the authors have contributed equally.

CONFLICT OF INTERESTS

Declared none

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