PREVALENCE AND DETERMINANTS OF ANTIBIOTICS MISUSE IN THE COMMUNITY OF KOZHIKODE, INDIA: A CROSS-SECTIONAL STUDY

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ABSTRACT

Antimicrobial resistance is a global health concern primarily driven by the irrational use of antibiotics. We aimed to investigate the prevalence of antibiotic misuse in society by conducting a cross-sectional observational survey among the general public. A cross-sectional study was conducted on 384 individuals aged 18-60, residing across the Kozhikode district using a validated questionnaire to understand the practices of antibiotic misuse, and the extent of knowledge on antibiotic resistance among the public. This study of 385 samples found that 85.7% had heard of antibiotic resistance, and 87% had used antibiotics previously. Notably, 33.8% bought antibiotics without consulting a doctor, often based on previous prescriptions (49%) or internet advice (17%). Misuse reasons included self-cure beliefs (44.5%) and cost-saving (21.5%). Alarmingly, 48% obtained antibiotics without a prescription from the pharmacy. Despite awareness programs reaching 53% of respondents, misuse remains prevalent, with only 54% completing their courses and 65% reporting doctors prescribing without lab tests. Antimicrobial resistance is rising and could become uncontrollable without prompt action. Proper antibiotic administration is essential. Identifying community flaws in antibiotic use can aid in addressing this issue. Public education, regardless of age or socioeconomic status, is crucial. Campaigns, workshops,

events like "Antibiotic Awareness Week," and social media efforts can promote responsible antibiotic use. Enforcing policies that ban non-prescription antibiotic provision is vital to limit unnecessary consumption.

KEYWORDS: Antibiotics, Antimicrobial resistance, Lack of knowledge, Misuse, Inappropriate use, Awareness, Mortality, Target modification, Public health.

INTRODUCTION

Antibiotics are powerful medications that fight bacterial illnesses by either killing or suppressing their growth. Their discovery revolutionized medical care, drastically lowering mortality rates from bacterial infections. Antibiotics treat many diseases, from minor skin infections to life-threatening conditions. Nonetheless, the widespread and sometimes inappropriate use of antibiotics has resulted in a growing concern: antibiotic resistance.[1-5] The emergence of drug-resistant bacteria threatens to undo the progress in combating infectious diseases. Bacteria can evolve and acquire resistance to antibiotics, rendering some treatments ineffective. The key processes by which bacteria exhibit antibiotic resistance include reduced permeability to the drug, inactivating enzymes, increased efflux of drug out of the cell, and modification of the drug target.[6-8] Globally, Asian countries have the highest burden of drug-resistant strains and India is one of the major consumers of antibiotics where their overuse and misuse are increasing significantly.[9-11] The widespread and inappropriate use of antibiotics in India, driven by factors like over-the-counter availability and lack of awareness, exacerbates the problem. The consequences of antibiotic resistance are far-reaching, including prolonged illness, increased healthcare costs, and a heightened risk of mortality. With very few antibiotic classes entering the market proper and judicious use is necessary to maintain their effectiveness over time and prevent the emergence of antibiotic-resistant bacteria.[12-14] Given the critical importance of this issue, our study aims to explore the prevalence of antibiotic abuse in society. To get information on the appropriate and inappropriate use of antibiotics[15-17], we performed a cross-sectional observational study among the general questions including the questions such as what is the prevalence of antibiotic misuse among the general public, what are the factors contributing to antibiotic misuse, what are the knowledge gaps and misconceptions about antibiotic use among the public[18-23], what are the implications of antibiotic misuse for public health. Our research and the results of this poll will shed light on usage patterns for antibiotics and assist in developing strategies to encourage greater mindful use of these essential drugs.[24] By exploring the

knowledge, attitudes, and practices related to antibiotic use, we hope to identify areas for intervention and contribute to the development of strategies to promote responsible antibiotic use. We can better address the issues of antibiotic resistance and endeavor to ensure the continued usefulness of these necessary medications for future generations if we are aware of the extent of antibiotic overuse.[25, 26]

MATERIALS AND METHODS

The descriptive cross-sectional observational study was conducted in different communities of Calicut district, Kerala for one month. The goal of the study was to comprehend the various facets of antibiotic abuse, the causes of antibiotic resistance, and the common diseases for which antibiotics were misused. The study included adults between the ages of 18-60, belonging to different socio-economic backgrounds such as students, professionals, and public workers. Special populations such as geriatrics, pediatrics, and pregnant women were excluded from the study.[27] A questionnaire was prepared in Google Forms format to collect data on patient demographic details such as name, age, profession, and gender of all participants. Participants completed a self-administered questionnaire prepared both in English and native language Malayalam which included multiple-choice questions and closed-ended questions regarding antibiotic misuse. The questionnaire was developed and validated previously.

Sample size

Since there aren't many studies that are comparable in the literature, the sample size was determined using an infinite population formula. After that, it was transformed into a finite population by considering the entire population in the research region. A 95% confidence interval along with a 5% margin of error, standard deviation of 0.5 was considered.

For an infinite population,
Sample size

$$S.S = \frac{(Z.SCORE)^2 * SD * (1 - SD)}{(Margin\ of\ error)^2} \qquad (1)$$

For finite populations,
Based on the population

Adjusted sample size

$$S.S = \frac{S}{1 + (\frac{(S-1)}{Population})}$$ (2)

therefore, the final minimum sample size was 384.

RESULTS AND DISCUSSION

There was a total of 385 samples. Most of them (85.7%) have heard of the rising alarm on antibiotic resistance, rest were unaware of the same. There was a total of 385 samples. Most of them (85.7%) have heard of the rising alarm on antibiotic resistance, rest were unaware of the same. The majority of people (87%) used antibiotics for their previous treatments. About 33.8% of people buy antibiotics from pharmacies for treatment without consulting a doctor **(Figure 1)**. This percentage indicates an alarming rate as very few antibiotic classes are entering the market and irrational use may lead to ineffectiveness of the treatment regimen afterwards. When the reason for antibiotics self-medication was asked 44.5% felt that the disease would be cured by taking the antibiotic they chose, 34% due to lack of knowledge of antibiotic resistance, and 21.5% to save money **(Figure 2)**.
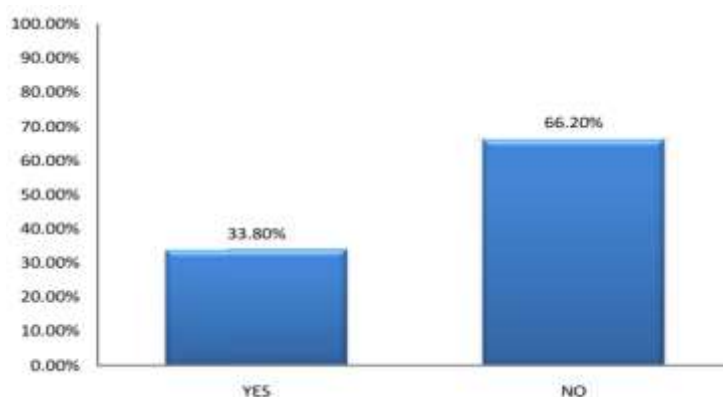

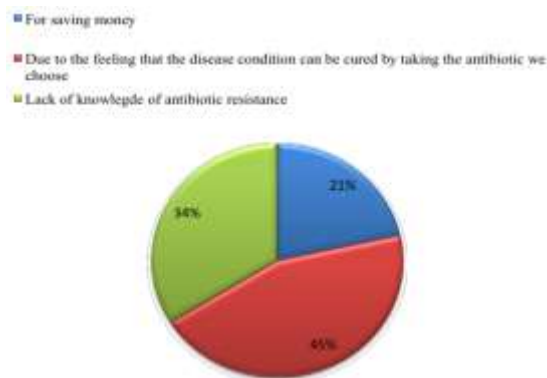**Figure 1: Pattern of buying antibiotics without a valid prescription from the pharmacy.**

Figure 2: Reasons for usage of antibiotic self-medication.

This points out the antibiotic misuse, and lack of awareness of the public about antibiotic resistance and its consequences. Most people (49%) buy antibiotics from the knowledge of previous prescriptions to treat similar conditions. About 17% of people buy antibiotics from the knowledge obtained from the internet, 15% of people buy antibiotics from the knowledge obtained from friends and 19% of people buy antibiotics that are provided by pharmacists as self-medication **(Figure 3)**. Lack of strict enforcement of guidelines for antibiotics dispensing is observed. Pharmacists dispensing antibiotics without a prescription is a major concern. 48% of people get antibiotics from the pharmacy without a prescription. Pharmacists must be made aware of the need for judicial use of antibiotics and strict laws must be enforced to prevent antibiotic misuse. The majority of people (74%) have not faced any disturbances while taking antibiotics. It promotes the irrational use of antibiotics. People should be conscious of the impacts of antibiotic misuse.
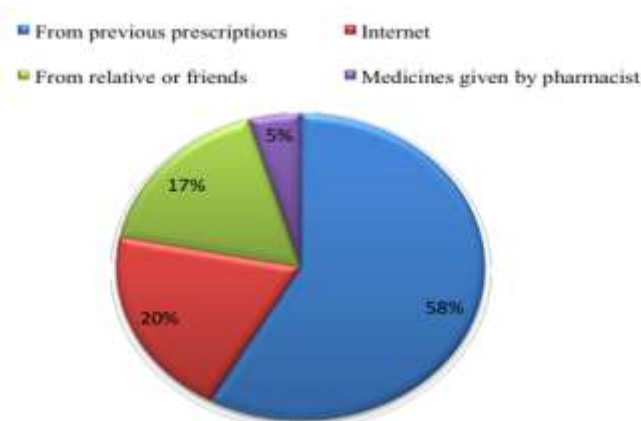

Figure 3: Knowledge of antibiotic self-medication.

Considering the diseases for which antibiotics are used,68.5% of antibiotics used are for the treatment of cough, 43% for throat pain, and a smaller proportion for respiratory tract infections, wound infections, and other diseases **(Figure 4)**. Nearly 54% complete the course of antibiotics while taking them, 28% stop consuming antibiotics once their disease condition gets better and the rest are unsure about course completion **(Figure 5)**. Antibiotic resistance can arise as a result of incomplete courses, which can also render medications ineffective. We also inquired about doctor's prescription habits for antibiotics and about 65% said that doctor prescribes the antibiotic without conducting any laboratory tests. There are various classes.
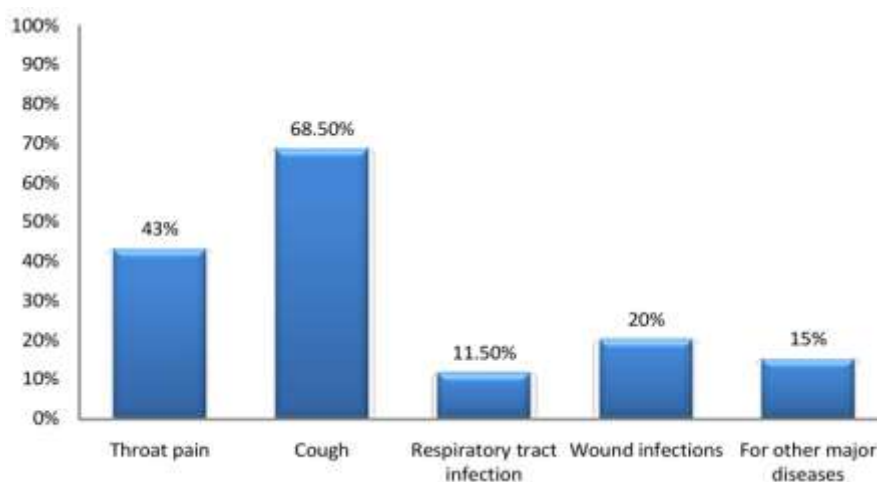
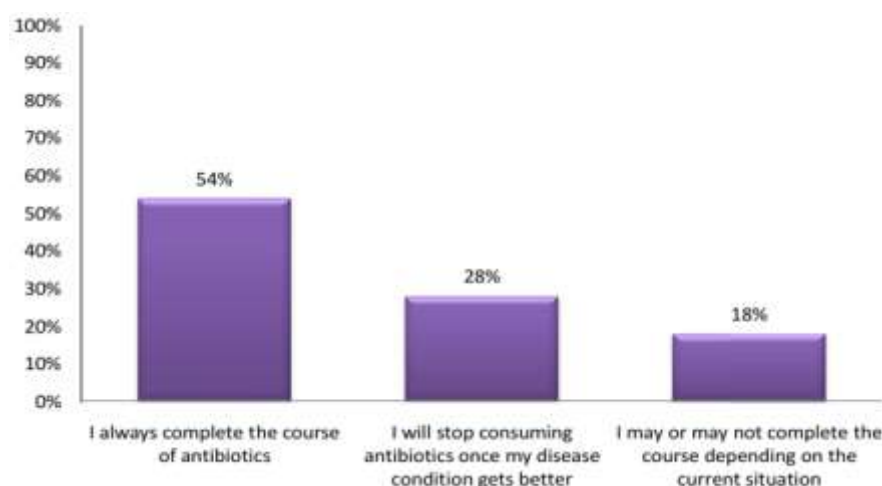**Figure 4: Diseases and antibiotics usage.**

Figure 5: Habit of consuming antibiotic.

Of broad and narrow-spectrum antibiotics available in the market, these must only be prescribed based on valid laboratory tests after identifying the disease-causing bacterium. Multiple antibiotic use at the same time is observed in 11% of people, which may have serious consequences and must be avoided. Along with this 22% switched from one antibiotic to another due to ineffectiveness. The reason for the ineffectiveness can be due to the development of antibiotic resistance. 65% of people get to know about the importance of antibiotic course completion either from doctors or pharmacists and about 53% got awareness classes on antibiotic resistance or misuse of antibiotics. Even though people to an extent are aware of antibiotic resistance, still the practice follows which must be addressed appropriately to avoid threats like antibiotic resistance.

To our knowledge, this is the first survey about antibiotic misuse within the state, of Kerala. Misuse of antibiotics causes antimicrobial resistance, a growing global concern.[28-31] Previous research on Jordan's antibiotic use and antimicrobial resistance has mostly concentrated on particular populations, which include university students, healthcare professionals or patients attending outpatient clinics.[32] Nonetheless, not much research has been done that reflects the general public, who use oral antibiotics primarily. 34% of the sample population almost self-medicates with antibiotics; this figure is comparable to earlier research by Yusef *et al.*[11] and Al-Azzam *et al.*[9] studies (38% and 39.5% respectively). Our study revealed that most people (85.7%) have heard of antibiotic resistance. Although about 34% of them have purchased antibiotics from the pharmacy without a prescription, indicating the widespread practice of antibiotic misuse, we are uncertain of their level of understanding. To prevent the unnecessary use of antibiotics, the public must be educated about "antimicrobial resistance" and the "need for judicial use of antibiotics". From the study, it was also evident that 28% of them stopped the antibiotic if they felt better and did not complete the course. According to a recent Australian study, almost half of antibiotic users stop taking the drug if they feel better and save it for later use.[33-37] Course completion ensures that all illness-causing bacteria are killed or prevented from multiplying. Participants, a minor part (11%) consume more than one antibiotic at a time and 22% of people have switched from one antibiotic to another due to their ineffective results. This switching must be based on laboratory tests and a valid prescription.[38-41]

Pharmacies are a crucial contributor to antibiotic misuse, representing a key supply -side factor. The majority of antibiotic use worldwide occurs in outpatient settings, where non-prescription access and over-the-counter sales at pharmacies are common.[42-46] 48% of pharmacists dispense antibiotics without a valid prescription, this rate was surprising and alarming.

Despite the Indian Drugs and Cosmetics Act's mandatory laws prohibiting the purchase of antibiotics without a prescription, the majority of the nation has easy access to over-the-counter medications due to lax implementation of this law. Antibiotic self-medication is commonly seen for diseases like cough and throat pain. People consider antibiotics to be only used for the treatment of these diseases, they are unaware of different types of bacterial infections[47], the spectrum of each antibiotic, and their proper mechanism of action. As reported by Shehadeh *et al.*[10], 51% of respondents agreed that antibiotics are recommended

for the common cold. We found that the majority chose their antibiotics from previous prescriptions, keeping in mind the same disease can be treated with the same medicine. This trend has a high chance of emerging antibiotic resistance conditions. Nowadays vast data is available on the internet and people also refer to them for choosing an antibiotic.

Every individual must be aware of antibiotic misuse, overuse, and antibiotic resistance. A public education campaign regarding managing self-limiting illnesses is required, as is enforcement of laws prohibiting the sale of antibiotics without a prescription or over-the-counter. Both a public education campaign and the enforcement of laws that forbid the selling of antibiotics over-the-counter or without a prescription are necessary to manage self-limiting infections. Many factors affect physician prescribing behaviors, including patient demand, time constraints, uncertainty about diagnosis, and litigation fear. The promotion of appropriate antibiotic use among physicians can be accomplished by involvement in antibiotic stewardship programs.[48,49], consistent training, adherence to clinical recommendations, and decision-support systems. Subsequent investigations ought to assess the influence of public awareness campaigns in mitigating antibiotic abuse and exploring the efficaciousness of interventions aimed at doctors, pharmacists, and patients.[50-55] It's important to investigate how technology, including smartphone apps, can encourage the safe use of antibiotics. Furthermore, carrying out longitudinal research will aid in evaluating the long-term impacts of intervention and education tactics on antibiotic usage behaviors.

Notwithstanding its contributions, this study has several notable constrains. There is a chance that bias will be introduced because the sample population is not representative of Kerala as a whole. Self-reported information can be erroneous since participants may report using antibiotics more or less than they did. Our study's focus was restricted to oral antibiotics, indicating that more antibiotic types should be investigated in further studies. To address these shortcomings, future studies should recruit a more varied sample population, use objective metrics, and examine additional factors impacting antibiotic overuse.

CONCLUSION

The potential danger of antimicrobial-resistant organisms is on the rise and will become uncontrollable if not addressed quickly. Proper antibiotic administration is crucial for combating this possibly lethal adversary. Identifying flaws in the community's antimicrobial use and resistance can help find answers to this growing issue. Regardless of age or socioeconomic background, public education initiatives like campaigns, and workshops are

recommended to increase knowledge about optimal antibiotic usage among all members of the community, including medical professionals. Social media, online awareness campaigns, and events like "Antibiotic Awareness Week" can help advance public education on antibiotic usage responsibly both domestically and globally. Limiting unnecessary antibiotic consumption can be achieved by enforcing policies that ban the provision of antibiotics without a prescription.

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