

REVIEW ARTICLE

Self-medication: Is a serious challenge to control antibiotic resistance?

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ABSTRACT


According to the WHO, “Self-medication is an element of self-care based on selection and use of medicines by individuals to treat self-recognized illnesses or symptoms.” Antibiotics are necessary drugs in developing countries where most of the death due to infectious diseases. Growth of pathogen resistance in human to antibacterial drugs mainly due to the antibiotic self-medication and is a major reason for the transmission of antibiotic drug resistance. Self-medication with antibiotics can lead to irrational drug use, which exposes patients to drug interactions, development of drug resistance, and difficulties in diagnosing different diseases. Inadequate dose, less duration of treatment, and the often regarded as the irrational drug use practices in self-medication practice. Therefore, standard guidelines for the antibiotic use should be framed to reduce the human pathogen resistance along with proper educational programs in the community level to improve the knowledge of the patients about the adverse effects and consequences of self-medication practice. The review mainly focused to discuss the prevalence, commonly treated illnesses, source of antibiotic choice, antibiotic usage, causes of self-medication, consequences, the influence of resistance on economy and health of public, and different challenges. This paper also discusses the current scenario of antibiotic resistance and newer antibiotic development.

KEY WORDS: Antibiotic Resistance; Self-Medication; Prevalence; Infectious Disease

INTRODUCTION

“Self-medication is an element of self-care based on selection and use of medicines by individuals to treat self-recognized illnesses or symptoms.^[1]” Among the world, antibiotics are mainly used to purchase as compared to other class of drugs.^[2] The different aspects which lead to antibiotic self-medication are poverty, unreachability, medical professional’s unavailability, healthcare facilities of a low standard, uncontrolled medicines distribution, and consumer’s misinterpretation about physician’s attitude.^[3,4]

Self-medication with antibiotics can lead to irrational drug use, which exposes patients to drug interactions, development of drug resistance, and difficulties in diagnosing different diseases.^[5,6] Inadequate dose, less duration of treatment, withdrawal of treatment on reduction of symptoms of disease, and distribution of medicines to other patients are the often irrational drug use practices in self-medication practices.^[7] The major problem with the antibiotic resistance is the development of bacterial strains of multidrug-resistant, which are resistant to almost all the class of antibiotic drug available in the market. Increased duration of illnesses, frequent doctor visits, more hospital stays, decreased drug options, the requirement of costly medications, and even death are the end products of antibiotic drug resistance.^[8] The increased probability of self-medication with antibiotics is mainly due to inappropriate dispensing practice, important that all the sales should be regulated to control the misuse of the antibiotics.

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Bacterial resistance now becomes a major concern for physicians from all over the world due to its vast spread in society and potential hazardous behavior.^[9] Evidence required from the different studies to implement various steps to improve the drug use among the community. These evidence-based information helps to decrease bacterial resistance.^[10]

PREVALENCE OF SELF-MEDICATION

About 7.3–85.59% is the prevalence of self-medication among various countries, with an average prevalence of 42.64%. The rate of prevalence varies greatly between the study volunteers and different countries. Among the various countries, India and Nepal resulted in high prevalence of self medication practice and low rate of self medication practice reported from Indonesia and Bangladesh. The males were more exposed to self-medication with antibacterial in most of the studies. The medical students and health professionals are more prevalent to self-medication with antibiotic while comparing with the general public.^[10]

In India, the prevalence of self-medication differs greatly between different regions of the country. About 55% of self-medication practice reported in Meghalaya, which were male gender predominates the female gender in the use of self-medication.^[11] Similarly, Ahmad *et al.* stated that 50% of self-medication practice shown in Northern India.^[12] The study in Uttar Pradesh shows the prevalence of 69.6% within the recall period of 1 year^[13] and in Southern Rajasthan, the prevalence of self-medication was found to be 73.6% within recall period of past 3 months.^[14] In South India, Balmurugan and Ganesh revealed that 71% of the study population using self-medication practice.^[15] However, the study in medicals students of South India reports 92% of self-medication practice.^[16] The study from Urban Delhi shows a significant higher percentage of self-medication practice with 92.8%.^[17] In Puducherry and Kochi, the prevalence of self-medication much lesser than other places with 11.9%^[18] and 21.5%,^[19] respectively.

Outside India, the prevalence of self-medication was found to be 77.6% in Malaysia^[20] and 86.4% in Brazil.^[21] In China, self-medication practice is reported with approximately half of the total study population (50%).^[22] About 69.2% practiced self-medication in Italy at least once^[23] and prevalence of self-medicine use in Sri Lanka was reported that 33.9% and 35.9% in urban and rural population, respectively.^[24] In Ethiopia, Abrha *et al.* stated that 62.8% of subjects using self-medication practice as modern drugs and herbs which were females are more self-medicated than male population^[25] and Shafie *et al.* revealed that 69.9% were female and 30.1% were male with self-medication prevalence rate of 75.5%.^[26] According to Afridi *et al.* and Baig, the prevalence of self-medication was reported to be 84.8% (males 88.4% and females 81.2%)^[27] and 61.2% (males 64.5% and females 58.5),^[28] respectively,

in Pakistan. The prevalence of self-medication practice in elderly patients of Iran was reported to be 83%^[29] and significantly lesser 33.7% of prevalence was found to be in students of Kermanshah University of Medical Science in Iran.^[30]

COMMONLY TREATED ILLNESSES

Self-medication mainly used for the symptoms or illnesses such as fever, gastrointestinal tract diseases, sore throat, respiratory diseases, and common cold.^[10]

In Northern Israel, upper respiratory tract infection and cystitis are the most frequent disease condition for the use of antibiotics followed by tonsillitis, pneumonia, and otitis/sinusitis.^[31] Similarly, antibiotics usage mainly reported for cystitis disease condition in Sweden.^[32]

In Northwest Nigeria, Ajibola *et al.* revealed that “malaria, typhoid, stomach pains, diarrhea, and dysentery were the most common illnesses for which self-medicated antibiotics were used among undergraduate students and community members.^[33]” In Northwest Ethiopia, Gelayee stated that “headache was the common symptom for irrational use of antimicrobials.^[34]”

Similarly, bronchitis, sore throat, and common cold were the most prevalent causes for self-medication, followed by urinary tract infection and dental infection in Europe.^[35,36]

CAUSES OF SELF-MEDICATION

Nowadays, patients desire to take a prominent part in the nurture of their own health and are frequently capable to control recurrent and chronic infections after correct medical diagnosis and with only periodic professional advice, for example, use of antifungal agents, antibiotics, oral contraceptive drugs, topical corticosteroids, and histamine H₂-receptor blocker agents. They are preferably reluctant to accept to the troublesome of attending a doctor as they think they can handle the situation with their own knowledge.^[37]

Phalke *et al.* stated that “Urge of self-care, feeling of sympathy toward family members in sickness, lack of time, lack of health services, financial constraint, ignorance, misbelieves, extensive advertisement, and availability of drugs in other than drug shops are responsible for growing trend of self-medication.^[38]”

Similarly, Nepal and Bhatta. stated that “Previous experience of treating a similar illness, feeling that the illness was mild and did not require the service of a physician, less expensive in terms of time and money, gaps in terms of knowledge, attitudes, and practices regarding antibiotic use, such as keeping leftover antibiotics for future use, sharing antibiotics

with others, and belief that antibiotics can speed up recovery and eradicate any infection, were the most common reasons for self-medication with antibiotics among the general public.^[10]

ANTIBIOTICS USAGE IN SELF-MEDICATION

As the information from Apoteket (the National Corporation of Swedish Pharmacies), penicillin V and doxycycline were the most widely used antibiotic in the region.^[39] Similarly, penicillins were the most commonly used antibiotic followed by cephalosporins and macrolides in Northern Israel.^[31]

Furthermore, the metronidazole and ampicillin/cloxacillin were the most repeatedly used antibacterial in the group of undergraduate students and community members, respectively. In addition, the community members are more exposed to self-medication with ciprofloxacin as compared to undergraduate students.^[33] The reports in Bangladesh similar to the study of undergraduate students as metronidazole were the most commonly self-medicated antibiotic.^[40] Penicillins (ampicillin and amoxicillin) are regularly used for the treatment of different diseases among Nigeria, UAE, and Mongolia revealed in similar studies.^[41-43]

In Nigeria and other developing countries, fluoroquinolones inappropriate use has been the main reason for the transmission of pathogens of fluoroquinolones resistant, causes first-line treatment/empirical therapy more difficult to cure the diseases such as typhoid and other bacterial infections.^[44,45]

Dermatological problems and stomach ache/diarrhea are often self-reported adverse reactions.^[36]

SOURCE OF ANTIBIOTIC CHOICE

Antibiotics can be easily procured in developing countries as compared to western countries were mainly due to the strict rules for the use of antibiotics in patients. As a result, less cases of antimicrobial resistance reported from developed countries when compared to developing countries.^[46]

The pharmacists were the major source for the choice of self-medication with antibiotic followed by friends and family. As compared to the doctors, the pharmacist has limited amount of knowledge about the disease pathology. Hence, the pharmacist mainly considered for the patient counseling about the drug use and its consequences, instead of dispensing medication without a valid prescription. Thus, counseling patients, promoting rational use of antibiotics and elimination of drug dispensing without the right prescription are the main duties of a pharmacist.^[10]

Dispensing without prescription was the main source for the self-medication in eastern countries, followed by leftover

medications. However, as compared to the northern, southern, and western countries, leftover medication was the major reason for self-medication than the direct dispensing from the pharmacy. The other origin of self-medication was drugs procured from friends and relatives, stored drugs procured from abroad, and drugs obtained over the internet.^[35]

Similar two studies performed in the U.S., Ceaser, and Wurtz interviewed 101 adults on a city street, 26% comment that they had kept the remaining portion of their antibiotic prescription and 14% responded as they would use the leftover antibiotic without consulting a health-care provider.^[47] In suburban Emergency Department, 43% of patients reported using antibiotics in the past year (vs. 38% in the present survey) and 17% had taken antibiotics available in the premise without consulting a physician in a second survey of 1363 patients.^[48]

CONSEQUENCES

A vital drawback of antimicrobial self-medication is the continuing emergence and spread of antimicrobial resistance all over the world, with more cases reported from the developing countries than the developed countries due to the inappropriate drug dispensing without prescription.^[49]

Its indiscriminate use expands the severity of adverse events, symptoms of drug discontinuation, drug interaction, bacterial infection, hypersensitivity, and correct diagnosis tend to delay due to masking of diseases symptoms.^[49-52] Among, the development of bacterial strains of multidrug-resistant, often called as “super bugs” is the most important complication in antibiotic self-medication. These harmless bacteria can cause life-threatening infection by the development of multidrug bacterial resistance.^[53]

Fatal Diarrhea

In children, inappropriate use of antibiotics mainly due to the incorrect diagnosis of the disease, which was the main reason for the fatal diarrhoea in children. For example, treatment with antibiotics for common cold due to viral infection, which is completely ineffective except for secondary infection. According to Frieden, “When antibiotics are prescribed incorrectly, our children are needlessly put at risk for health problems including *Clostridium difficile* infection and dangerous antibiotic-resistant infections.^[53]”

Changes in Gut Flora

Irrational use of antibiotics may damage the normal function of gut flora. Due to high doses of antibiotics can kill beneficial bacteria in the intestine.^[53] Greater risk of urinary tract infection also due to the continuous exposure of small doses of antibiotics which may change the gut flora, as resulted in young women of child bearing age.^[54]

Transfer of Resistant Gene

The bacteria can transfer their resistant gene to other type of bacteria while progress through the colon and by secreting genes between the membranes. These resistant genes eventually develop into antibiotic drug resistance.^[53]

Untreatable Gonorrhea

Antibiotic resistant gonorrhea can develop through the inappropriate selection of drug and dose of the antibiotic medication. At present, CDC approves only cephalosporin antibiotics for the treatment of the drug-resistant gonorrhea.^[53]

The wrong or inappropriate drug use expands the probability for the growth and spread of antibacterial resistance. Therefore, proper guidelines for the antibiotic use should be framed to reduce the human pathogen resistance and other.^[55]

INFLUENCE ON ECONOMY AND HEALTH

The numerous resistant gene has been developed due to inappropriate antibiotic use^[56] and antibiotic resistance can be lead to a burden on cost, morbidity, and mortality.^[57] More toxic and expensive medications such as broad-spectrum antibiotics are required for the treatment of patients infected with drug-resistant microorganisms along with extended hospital stay.^[56,58]

Prolonged hospital stay, highly expensive second-line drugs, increased requirement of diagnostic tests and care, higher chance of complication, and isolation charges are the main factors that contribute to the expensive treatment of the patients.^[56]

In developing countries as compared to the developed countries, the effect of antibiotic resistance on health and economy is more significant due to the determinants such as increased health care cost, more vigorous disease condition, and tremendous increase in death rate.^[58]

CURRENT SCENARIO OF ANTIBIOTIC RESISTANCE

Recent studies reveal that the current available medicines are infective against the new infection and it is also important to note that the studies on discoveries of antibiotics against the antibiotic-resistant pathogens are limited.^[59,60] As compared to investment in drugs for chronic diseases, the pharmaceutical industries are not much interested in the development of newer antibiotics due to the concern of profit.^[59-63]

In India, antibiotic-resistant bacteria infections account for more than 58,000 infant deaths in 2013, and about a total 40% of the world's antibiotics are manufactured in India.^[64]

Nowadays, in some countries, a new practice has been followed as the transition of prescription drugs to Over The Counter (OTC) drugs often after a specified period time. The switch of "Rx to OTC" based on the scientific evidence, information from the patient about the use of drug and along with the experience in the treatment period. However, this switch promotes consumers to use drugs themselves to improve the disease condition without any proper consultation from the doctors. This practice can be lead to a more harmful condition in the patients for a long period of time.^[65]

DEVELOPING NEW ANTIBACTERIALS

Discovery of newer antibiotics should be immediately launched to prevent the drug-resistant pathogens and to minimize the mortality connected with drug resistance.^[61,66]

Today, we confront with a different situation, antibiotics currently available are losing their effect at an increased speed, along with diminished progress in new antibiotic development. In between the 1930s and 1960s, more than 12 new different classes of antibiotics were developed, but after that period, only two class of antibiotics were developed.^[67]

The optimal drug treatment for multi-resistant Gram-negative infections not achieved till yet, and no any development of drugs from novel classes is performed shows in a study conducted by the top 15 pharmaceutical companies. The study also shows that only 1.6% of antibiotics development in the total development of drugs.^[68]

However, reduced demand for antibiotics exists and the reduction of the anticipated return of investment due to the development of resistance, so the incentives are helpful to stimulate development of new antibacterial.^[68] Scientific challenges are also an important challenge for the development of new antibiotics.^[69]

The analysis at present must need to mainly focus on the current resistance patterns of the drug, in which more attention given to the drugs for the treatment of serious disease condition. At the same time, incentives should be provided to encourage the development of antibiotics with a new mechanism of action.^[70]

Another problem is unavailability of the economic and efficient diagnostic method with high specificity and sensitivity to differentiate the bacterial disease from viral disease and to find the bacterial resistance pattern.^[70]

CONCLUSION

Antimicrobial self-medication is an important concept to review to control antimicrobial resistance. Prevalence of antibiotic self-medication differs broadly among different

parts of the world, with the highest rates in Asia. Availability of drugs at home is accounted for the main risk factor for self-medication practice, which mainly encourages as in the form of leftover drugs.^[71-76]

The inappropriate use of antibiotics and the concurrent depletion in research and development of new antibiotics was the main reason for the development of antibiotic resistance. The attainment of a new era of medicine such as organ transplantation, cancer chemotherapy, and surgeries is restricted due to ineffective treatment and lack of standards in the prevention of antibiotic resistance.^[70]

Patients role as consumers is growing stronger in case of antibiotics used as they required to access the information and knowledge to improve the use of antibacterial in self-limiting infections, and treatment decisions should be based on scientific evidence along with modern tools is beneficial for the doctors to explain their decisions.^[78]

Reduction of inappropriate antibiotic usage requires action at several levels. First is the exigency for well-organized execution of previously framed law to ensure that antibiotics are available without a prescription should enforce regulatory measures restricting access to prescription-only. Second is the need for the improvement in the quality of health facilities to attract more patients to health settings for the treatment. Third, proper education programs should conduct at the community level to improve the knowledge of the patients about the adverse effects and consequences of self-medication practice.^[77]

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