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Rational Prescription Pattern of Antibiotics: A Quantitative Analysis Based on Khwaja Yunus Ali Medical College and Hospital (KYAMCH), Sirajganj, Bangladesh

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Authors' contributions

This work was carried out in collaboration among all authors. Author MEHM and MZA conceived and planned the experiments. MIS, MAS, FY, and MA conducted the survey and performed the analysis. MZA and MEHM contributed to the interpretation of the results and took the lead in writing the manuscript. FAK, MEA, NEKF, MRK, MA, AA and MK supervised and reviewed the manuscript. All authors provided critical feedback and helped shape the research, analysis, and manuscript as a whole. All authors read and approved the final manuscript.

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ABSTRACT

Antibiotics, alternatively known as antibacterial drugs, prevent or reduce the development of germs. A decade has been added to the life expectancy of human beings since the discovery of antibiotics. Antibiotic overuse can result in resistance to a wide spectrum of diseases and bacteria. Antibiotic utility is being jeopardized by the rise of resistance. There aren't enough innovative agents to deal with the problem of resistant strains. The current study targeted to highlight the current status of antibiotic use.The study was designed as a prescription-based survey where the medicines in prescriptions were checked containing antibiotics, whether the drugs were prescribed rationally or not. The study was conducted from February to July 2018 at Khwaja Yunus Ali Medical College and Hospital, Bangladesh. Patient's data were collected through review of patient medical records and prepared questionnaires. 100 people were interviewed, and their prescriptions were captured as photos and then checked for rationality.The antibiotics are prescribed in the group of 10 to 30 years, 31 to 50 years and more than 50 years of age.The survey demonstrated that 46% of patients know about antibiotics partially, about 74% of patients fulfill their entire course of medication and the rest of the patients stop taking medication after feeling better. Only 21% of patients knew about antibiotic resistance, whereas 37% of patients only heard about antibiotic resistance. According to the age group from low to high, 92.9%, 91.67%, 86.36% prescriptions were rational; 2.4%, 2.78%, 4.55% prescriptions were contraindicated and 4.7%, 5.56%, 9.1% prescriptions where medicines interacted with other non-antibiotic drugs, respectively. The overall rational prescription is 91%, whereas 3% of prescriptions are contraindicated and 6% of prescriptions showed interaction between antibiotics and other drugs (non-antibiotics).The study concluded that lack of knowledge and awareness of patients and inaccurate prescription data by physicians are two key factors that contribute to irrational antibiotic usage.

Keywords: Antibiotics; prescription; rational use; and out patients.

1. INTRODUCTION

Antibiotics are those agents which are well-recognized for their bactericidal and bacteriostatic properties [1]. There is a direct correlation of overuse/misuse of antibiotics with the probable result of resistance as well as increased healthcare costs [2]. In particularly, the people of low and middle-income countries consume more antibiotics as compared to developed countries. Bangladesh comes into this group; therefore it's worth looking at what kind of danger we're dealing with [3].

Good deals of research have revealed that prescription behavior is influenced to an extent by patients' expectations and physicians' perceptions as well [4]. In alleviating irrational prescriptions, particularly in the case of antibiotics, educational interventions aimed at physicians and patients have proved as useful along with the increased awareness of patients [5,6]. According to Moreland, "Widespread misuse of antibiotics has been reported in a specialized hospital for children" [7]. Incorrect use of antibiotics makes bacteria less sensitive, which in turn gives bacteria the opportunity to be resistant to that specific drug; which proves the importance of rational antibiotic use [8].

The target pathogens as well as the inhabitants of the human host are affected by antibiotic therapy. Antibiotic administration can result in an imbalance in the commensally good microbes, which can lead to problems such as antibiotic-associated diarrhea [9]. An increase in antibiotic resistance is indicative of the spread of resistance genes to the bacteria.

The World Health Organization (WHO) says that in European hospitals, on average, 25000 people die of antibiotic resistant infections at a cost of about 1.5 billion Euro. In 2013, according to the Centre for Disease Control and Prevention, 23000 people in the USA died from antibiotic-resistant infections.

Fleming says in his acceptance speech that antibiotics need to be used carefully, or they will be lost forever. Effective use of antibiotics can allow us to live longer and healthier [10]. Nowadays, antibiotics are often prescribed for no purpose. The future condition will be more critical if too many antibiotics are prescribed for viral infections. Besides, among all age groups, the highest proportion of antibiotics is taken by children where respiratory and gastrointestinal infections are major causes [11]. Only 35.7% of antibiotics are prescribed depending on diagnosis [12]. This scenario concludes that

64.3% of antibiotics are prescribed based on assumptions by physicians which cannot be called rational use.

The study target was to raise awareness among patients and most importantly among physicians regarding failure of antibiotic activity unless rational use along with a recall to the prescribers, drawing their attention towards the importance of antibiotic prescription.

2. METHODOLOGY

2.1 Survey Materials

It's a population and prescription-based survey. The prescriptions were collected from the patients who visited the Out Patient Department (OPD) of Khwaja Yunus Ali Medical College and Hospital. The patients who were interviewed based on a structured questionnaire were selected randomly to avoid selection bias. For this survey, those prescriptions were selected to have at least one antibiotic. The prescriptions were excluded where there were no antibiotics at all. 100 patients and prescriptions were observed in Out Patient Department (OPD) of Khwaja Yunus Ali Medical College and Hospital (KYAMCH) and in pharmacy (Patients having prescriptions from KYAMCH) for survey purpose.

2.2 Survey Methods

Information about antibiotic name, dose, number of doses per day, and route of administration was taken from the prescription. Other relevant information such as demographic data was obtained from the patients using direct questionnaires formed for the survey purpose.

2.3 Survey Questionnaires

Patients were cordially invited to answer the closed-ended questions. They can skip any question or decide not to answer. They are free to withdraw themselves from the survey at any time. The questions were regarding their knowledge of antibiotics, the term 'antibiotic resistance'; consulting with physicians before taking antibiotics, completion of an entire course of antibiotics all the time, etc. to find out the awareness and information gap among people. The questions were arranged in a systematic and consistent manner, taking help from previously completed works and modifying them according to the target interest. During the development and upon completion of the questionnaire, expert opinion was taken into consideration.

2.4 Rational Criteria for Antibiotics

In case of antibiotic dose, over-prescribing and under-prescribing in case of dose, multiple antibiotic brands from same generic, incompatible drugs (non-antibiotic) along with antibiotics which reduce the efficacy of antibiotics by deviating the pharmacokinetic property, incorrect prescribing and prescribing broad spectrum antibiotics where short spectrum could be used for optimal efficacy are some criteria considered as rational for antibiotic use. In this study, all the criteria were taken into consideration during checking the prescriptions.

2.5 Finding Irrational Prescription

Based on the above-mentioned criteria in section 2.4, prescriptions were checked for any of those errors and marked as irrational. After completion of checking, the number of irrational prescriptions was counted and that was the final percentage value of irrational prescriptions as the study examined 100 patients' prescriptions.

2.6 Statistical Analysis

The questionnaire data were analyzed and presented in percentage value while data concerning antibiotic name, dose, dose interval, dosage were presented in the form of tables and prescription frequency against antibiotic name was put as percentage value.

3. RESULTS

3.1 Results of Survey Questionnaires

Table 1. Patients' knowledge and awareness regarding antibiotics and their use.

Questionnaire Topic	Proportion (%)
Basic knowledge about Antibiotics	46 %
Familiarity with the term "Antibiotic resistance"	37 %
Consultation with physicians prior to antibiotic use	83 %
Completion of entire course of antibiotic	74 %

3.2 Results of the Medical Reports (Prescriptions)

Table 2. Rational or irrational use of antibiotics based on the number of prescriptions obtained in different age groups

Age Groups	Number of Prescriptions	Rational Prescriptions	Contraindicated drugs in Prescriptions	Interacted drugs in Prescriptions
20-30 years	42	39	01	02
31-50 years	36	33	01	02
Up to 51 years	22	19	01	02

Table 3. List of the antibiotics prescribed includes total dose, dose duration, dose interval indicating the percentage (%) of each over all the prescription

Name of the antibiotics	Dose per day(mg)	Dose interval (hour)	Dosage duration (day)	Percentage (%) prescribed
Amikacin	250/500	24	12-15	4%
Amoxicillin	1000/1500	8/12	3-7	6%
Flucloxacillin	400/500	12/24	7-10	4%
Phenoxymethyl penicillin	1000	12	7	2%
Cefaclor	1000	12	7	2%
Cefuroxime	400/500/1000	12	7	6%
Cefixime	400/800/1000/ 1500	8/12	4-10	17%
Cepharadine	250	24	15	4%
Ceftibuten	400	12	7-10	6%
Cefditoren	400	24	7	1%
Azithromycin	500	12/24	3-15	10%
Erythromycin	500	12	7	2%
Doxycycline	200	12	7-15	8%
Ciprofloxacin	1000	12	7-15	7%
Levofloxacin	500	24	7-15	9%
Moxifloxacin	400	24	5-7	4%
Gemifloxacin	640	12	7	2%
Clindamycin	300	24	10	2%
Chloramphenicol	500	12	7	2%
Rifaximin	1200	8	14	2%
Types of antibiotics= 14				100%

Table 4. List of the combinations of Antibiotics and Non-antibiotic (Incompatible) drugs

Combination of Antibiotic and Interacted drug	Prescribed (%)	Comments
Levofloxacin+Insulin	1%	Leads to altered glucose level. Actually, hypoglycemia occurs.
Ciprofloxacin+Theophylline	1%	Ciprofloxacin can raise theophylline levels by more than 100%, which can lead to systemic toxicity.
Azithromycine+Antacid	1%	Antacid reduced absorption of Azithromycin, resulting in reduced bioavailability and efficacy.
Levofloxacin+Antacid	1%	Antacid reduced absorption of levofloxacin, resulting in reduced bioavailability and efficacy.
Ciprofloxacin+Multivitamin	2%	Reduced absorption of oral multivitamins, supplements and dairy products resulting GI toxicity associated with diarrhea.

Table 5. Multiple Antibiotics prescribed to a single patient

Combine antibiotics	Prescribed (%)	Rationality	Overall percentage (%) of irrational use
Ciprofloxacin + Cephradine	2%	Rational	
Cefixime + Doxycyclin	3%	Rational	
Azithromycin + Doxycyclin	2%	Rational	
Ciprofloxacin + Cefaclor	1%	Rational	
Ciprofloxacin + Cefuroxime	1%	Rational	
Moxifloxacin + Neomycin	1%	Rational	
Azithromycin + Cefixime	2%	Rational	
Levofloxacin + Phenoxymethyl penicillin	1%	Rational	
Amoxicillin + Chloramphenicol	1%	Rational	
Amoxicillin + Doxycycline	1%	Rational	
Doxycycline + Cefditoren	1%	Rational	3%
Cefixime + Cefditoren	1%	Irrational	
Azithromycin + Cefixime + Doxycycline	1%	Irrational	
Moxifloxacin + Cefuroxime + Azithromycin	1%	Irrational	

4. DISCUSSION

From Table 1, it was found that only 21% of patients know about antibiotic resistance, which means among 10 antibiotic users, only 2 people know what would be the consequences if they do not use the medication properly. Most people have not heard of antibiotic resistance, so how can they be aware to prevent it? Patients have a tendency to self-prescribing which is not so alarming based on this study result, but ignoring the fact might turn the ratio higher. In the survey, about 74% of the patients followed the instructions about completion of the entire course antibiotics.

Table 2 shows the total number of prescriptions along with the number of prescriptions having contraindicated drugs and interacted drugs against an age group. There is no correlation of irrational prescriptions with age group, which indicates that physicians don't give priority or do not even underestimate their patients based on their age.

Table 3 was constructed keeping in mind to find out the most preferable generics of antibiotics. From the result, it was found that the most prescribed antibiotic was Cefixime (17%), a third generation cephalosporin. Macrolides were found in second position and Azithromycin (10%) was ranked as 3rd in case of choice of antibiotic. The rest of the antibiotics were found at minimum (2-6%) in case of being prescribed.

The list of combinations of antibiotics with non-antibiotic which are incompatible with each other is presented in Table 4. These combinations should not be prescribed and obviously an error from the physician's end. In the case of incompatible drugs combinations, either the antibiotic reduces or restricts the absorption of the non-antibiotic drug/s, which in turn ends up in reduced bioavailability or vice-versa.

Table 5 mentions the rationality of prescriptions where multiple antibiotics are prescribed. 3% irrationality was found, which is nominal considering percentage value, but those patients receiving those prescriptions are not getting proper treatment and considering this context, it cannot be overlooked.

Physicians can play a vital role in reducing irrational use of antimicrobials which in turn will surely affect the resistance pattern [13] and the statement was supported by this study result.

5. CONCLUSION

Antibiotics are regarded as the magic bullets which have represented a great revolution for mankind. However, irrational use of antibiotics has resulted in multidrug-resistant bacteria, the so-called "superbug" associated with moderate to severe side effects resulting in a substantial health hazard. The survey evaluated the level of irrational use of antibiotics where the underlying cause might be over prescribing of antibiotics as well as patients' lack of awareness and

indifference. In case of patients, it is a common fact that they are not aware of antibiotic resistance and its dose-related specification. On the other hand, physicians are of common nature in prescribing antibiotics against diseases whether they are specifically needed or not. If physicians educate patients about the antibiotics prescribed during a discussion session, the patients are able to develop awareness about antibiotic dosing. Besides, progress on surveillance and conducting education programs about medication among common people can decrease the irrational practice of antibiotic use on their part.

CONSENT

As per international standard or university standard, patient's consent has been collected and preserved by the authors.

ETHICAL APPROVAL

The institutional ethical approval was taken before starting the study by the ethical grant committee.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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