

ANTIBIOTICS MISUSE IN DIFFERENT HOSPITAL WARDS (A PILOT STUDY IN AN EGYPTIAN HOSPITAL)

OSAMA MOHAMED IBRAHIM, PH.D ^{1,2} AND MAHA SABER-AYAD, MD, MRCP ^{3,4}

¹Pharmacy Practice Department, College of Pharmacy, University of Sharjah, ²Clinical Pharmacy Department, College of Pharmacy, Cairo University, ³Pharmacology and Pharmaceutics Department, College of Pharmacy, University of Sharjah, ⁴ College of Medicine, Cairo University. Email: oibrahim@sharjah.ac.ae

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ABSTRACT

Introduction: Since the discovery of antibiotics many substances have become available for the treatment of infections. Unfortunately, after several decades of optimism misuse or overuse of antibiotics generates unnecessary costs, produces unwanted side effects, and causes the emergence of resistant bacteria. This is considered a serious problem in developing countries where the use of antibiotic is not properly audited.

Objective: The objective of this study was to observe and evaluate the appropriateness of antibiotics use and its prescribing pattern in four wards of a major University Hospital in Egypt.

Method: This prospective observational study was performed on four wards of a University Hospital. 1200 patients receiving antibiotics in wards of Surgery, Internal Medicine, Chest, and Critical Care Unit (CCU) were recruited (300 patients from each ward). The study was conducted over two years and was approved by the ethical committee of the hospital. All medication records of those patients were investigated and compared with standard guidelines and official policies of antibiotic therapy. The decision of appropriateness of antibiotic use took in consideration several factors such as the clinical data of patients, culture and sensitivity test results whenever available, and the need for dose adjustment in case of patients with renal impairment.

Results: Out of 1200 patients, 240 (20%) were considered receiving inappropriate antibiotic therapy in which 400 errors were found according to the first preference of the guidelines. The type of misuse of highest frequency was the inappropriate combination which represents 50% of the total, followed by the wrong dose regimen represented in 20% of the total. Nevertheless, higher frequency of misuse was found to be in Critical Care Unit (CCU) as more complicated cases were admitted. The pharmacists' recommendations were found to be more accepted in the Chest ward (100%) compared to other wards; whereas recommendations about inappropriate combination were more accepted compared to any other recommendations (70%).

Conclusion: Strict guidelines and valid policies should be implemented in hospitals to decrease the antibiotic misuse and decrease the risk of microbial resistance against the current known antibiotics. The study confirms that there is a misuse of antibiotics in hospitals and that the physician needs to follow strict guidelines to prescribe antibiotics. Also, the study revealed that the acceptance of physicians to the pharmacist recommendations is low while it should be taken in consideration when prescribing antibiotics to the patients.

INTRODUCTION

Since the discovery of antibiotics, many substances have become available for the treatment of infections. The advent of antibiotics, which are one of the most successful drug groups used in medicine, dramatically improved the prognoses of patients with bacterial infections. Their power in both therapy and prophylaxis was so convincing that many older antibiotics have never undergone controlled clinical trials. Unfortunately, following several decades of optimism, the excessive and indiscriminate use of these antibiotics in both human and veterinary practices has led to the emergence and dissemination of resistant organisms that endanger their efficacy, accompanied by unwanted side effects and high cost ¹.

Misuse of antibiotic therapy, including failure to complete therapy, skipping of doses, reuse of leftover antibiotics, inappropriate choice of antibiotics, inappropriate combination, inappropriate dose regimen and too long duration of drug usage can potentially expose patients to suboptimal doses of antibiotic therapy. Such antibiotic-taking behavior can result in insufficient antibiotic exposure for eradicating infectious bacteria and potentially create an environment that promotes antibiotic resistance ²⁻⁴. Antibiotic misuse or over-use may increase the emergence of resistant bacteria and as a result increase the selection pressure on physicians who tend to prescribe newer broad spectrum agents for excessive periods of time ⁵. Antibiotic resistance has become a serious problem in both developed and developing nations. In certain settings, such as hospitals and some child-care locations, the rate of antibiotic resistance is so high that the normal, low cost antibiotics are virtually useless. This leads to a never-ending ever-spiraling race to discover new and different antibiotics just to keep us from losing ground in the battle against infection. The fear is that we will eventually fail to keep up in this race, and the time when people did not fear life-threatening bacterial infections will be just a memory of a golden era ⁶.

Several factors contribute to antibiotic resistance, including misuse on the part of physicians and patients, higher rates of infection

transmission due to increased travel, and use of antibiotics in agriculture. Once resistance is established, it cannot be reversed, but proper use of antibiotics minimizes the flourishing of resistant strains. Drastic measures should be taken to promote appropriate antibiotic prescribing and minimization of development and spread of resistant bacteria ¹.

As the problem of Antimicrobial agent misuse has become an increasing health care problem in Egypt, we designed this study to measure the magnitude of the problem, so that effective solutions can be suggested and planned for.

METHOD

This observational study was conducted over 2 years (2007-2009) on 1200 patients receiving antibiotics admitted to surgery, internal medicine, chest and Critical Care Unit (CCU) wards of a major university hospital in Egypt (about 1500 beds). The study was approved by the ethical committee of the hospital.

All medication records of the patients were investigated and compared with standard guidelines and official policies of antibiotic therapy, taking into consideration the clinical data of the patients, sensitivity culture test results, and proper dose adjustment (using serum creatinine reports) in case of patients with renal impairment.

For all patients on antibiotic therapy, a standardized sheet was completed including patient's hospital ID number, the provisional clinical diagnosis, any microbiological test results, the antimicrobial agents administered, whether the prescription was based on those results or empirically used and the dosage of the drug administered. The last section of the sheet was allocated to the type of inappropriate antibiotic use if any. Errors were classified as follows:

(I) inappropriate choice of antibiotic, (II) inappropriate antibiotic combination, (III) inadequate dose regimen and (IV) inadequate duration. Data were statistically analyzed using SPSS program (version 11).

RESULTS

The study included 1200 patients on antibiotic therapy with a mean age of 57.3±1.4 years (range: 21-83 years), 56.7% females (n =680). Average duration of hospital stay was 4.3±1.1 days. Out of the study population, 62.3% were known to have chronic diseases, whereas 37.7% were admitted due to an acute condition.

Of the 1200 on antibiotic therapy, 240 patients (20%) were considered receiving inappropriate antibiotic therapy in which 400 errors were found. Whereas 20 patients were receiving 4 antibiotics, 8 patients were receiving 3 antibiotics, 200 patients were receiving 2 antibiotics, and only 12 patients were receiving 1 antibiotic. By using the "One way ANOVA" at P<0.05 followed by Duncan t-test, there was a significant difference between zones in antibiotic misuse. Nevertheless the highest number of antibiotics misuse was found in the CCU ward (mean=3.14), followed by the surgery ward (mean=1.47). These results are shown in Table 1.

Table 2: Types of misuse occurring in each zone

Types of Misuse	Surgery		Internal Medicine		Chest		CCU	
	Count	%	Count	%	Count	%	Count	%
Inappropriate antibiotic	8	2%	6	1.5%	2	0.5%	44	11%
Inappropriate combination	40	10%	9	2.25%	80	20%	71	17.75%
Too long duration	8	2%	5	1.25%	2	0.5%	45	11.25%
Wrong dose regimen	7	1.75%	30	7.5%	3	0.75%	40	10%

The degree at which pharmacists' recommendations were accepted varied according to the hospital zone. The chest ward showed the highest percentage of acceptance (100% of cases), while in surgery ward only 50% acceptance rate was recorded. In the internal medicine zone pharmacists' recommendations were accepted in 33.3% of cases. On the other hand, CCU showed the least acceptance to the pharmacist's recommendations (14.29%).

As it is shown in Table 3, the acceptance rate of pharmacists' recommendations based on the type of misuse. The results revealed that the highest acceptance rate was for recommendations about inappropriate combinations (acceptance rate of 45% of the total recommendations regarding the use of inappropriate combination)

Table 3: Pharmacists' recommendations acceptance rate based on the type of misuse

Types of Misuse	Percentage of physicians acceptance to the recommendation of the pharmacist
Inappropriate antibiotic	16.67%
Inappropriate combination	45.00%
Too long duration	33.33%
Wrong dose regimen	25.00%

DISCUSSION

Antibiotics are one of the major causes of drug-related problems. The appropriate choice and utilization is mandatory to provide effective and safe management of infectious diseases. Accordingly, the role of clinical pharmacist, as a member of the patient care team, is pivotal in providing the proper consultation for the physician regarding utilization of antibiotics.

Our study focuses on the pattern of antibiotic use in 4 different zones (departments) in a large tertiary referral hospital. It is expected to have low rate of inappropriate use of medications in the setting of such hospitals. In our study the collective rate was 20%. In contrast, a Turkish study showed that the irrational antibiotic use in Ankara Numune Education and Research Hospital was 59.3%. Interestingly, the Antibiotic Control Committee implemented an antibiotic restriction policy in 1999, aiming to ensure the correct and restrictive use of broad-spectrum antibiotics, which resulted in

Table 1: Frequency of antibiotic misuse in each zone

Zone	Mean number of misuse events/ prescription	SD	F-value	P-value
Surgery	1.47	0.41	3.54	0.032*
Internal medicine	1.12	0.24		
Chest	1.08	0.16		
CCU	3.14	0.79		

S.D. = Standard deviation

* = There is a significant difference between the misuses in zones by using one way ANOVA at P < 0.05 followed by Duncan t-test

Among the different types of misuses studied, the inappropriate combination was the most pronounced as it composed 50% out of the 400 errors found followed by wrong dose regimen (20%), followed by inappropriate antibiotic and too long duration (15%) for both. Table 2 shows the type of antibiotic misuse occurring in each zone.

reduction of inappropriate use of antibiotics down to 22.4%, according to a study published in 2005⁷. This shows how promising the results will be, if a similar policy is adopted in the Egyptian

hospitals, taking in consideration the impact on the efficacy, safety and the costs of antibiotic use.

Parret et al. demonstrated that the cost of the antibiotic used on the medical and surgical wards of a university hospital could be cut by 3.5% if the recommendations of Infectious Disease (ID) consultants are followed⁸. The study group of Fraser et al. previously showed that the implementation of guidelines could help to save \$400 for every antibiotic treatment prescribed⁹. Similar observations were also reported for surgical prophylaxis¹⁰. Furthermore, the need to obtain the ID consultant's authorization before administering antibiotics generated a significant decrease of about 73.3% in the yearly \$1.4 million allocated to antimicrobial agents at the Yale-New Haven Hospital¹¹.

The percentage varied from a department to another. The highest antibiotic prescription errors were observed in the medical CCU. The mean number of misuse events was 3.14 / prescription, which was statistically significant, compared to other departments (p-value = 0.032). Such high rate is thought to be related to the criticality of the cases that may necessitate usage of different antimicrobial agents to cover a wide spectrum of organisms, waiting for culture and sensitivity results. It may be also related to the fact that negative results are sometimes obtained due to inadequate samples taken for culture and sensitivity or the inability to isolate the organism when the patient has already received different types of antibiotics. Patients are sometimes non-compliant or they do not keep the prescriptions of the types of antibiotics they received, another important issue related to the archiving of the medical records and the organization of the health system in Egypt.

Inappropriate antibiotic utilization in surgical wards was surprisingly low in our study, when compared to other previous investigations. In Switzerland, Bugnon-Reber et al. reported a higher rate of antibiotic misuse in surgical versus medical departments (58% vs 34%),¹². Similar findings have been also reported from the study group of Moss et al. who showed a particularly high rate of antibiotic misuse in surgical prophylaxis, with only 5% of prescription fulfilling all the usual requirements and 22% fulfilling

none of them ¹³. Surgeons are particularly prone to disregard published guidelines for surgical prophylaxis and depend on anecdotal evidence, chiefly by keeping operated patients on antibiotics for unnecessarily long periods of time. These errors contributed substantially to the higher rates of antibiotic misuse found in surgical wards. The majority of our patients were recruited from surgical wards dealing with patients admitted to be subjected to certain investigations long time prior to surgery. Such an issue is of concern in the Egyptian Health System and should be solved by better organization of health care facilities all through the country.

Inappropriate antibiotic combination represents the major type of inappropriate use of antibiotics (45% of collected prescriptions). This was mostly observed in the Chest department (20%) and the medical CCU (17.7%). This is in contrast to the results of Erbay et al., 2005. This Turkish group calculated the rate of occurrence of "spectrum overlap" to be only 5.9%. This discrepancy can be explained by more rigorous prescription auditing in the Turkish hospitals.

The rate of acceptance of the critical care physicians to the pharmacists' recommendations has been estimated to be the lowest among all departments (14.29%). A recent systematic review showed that antimicrobial stewardship is associated with improved antimicrobial utilization in the intensive care setting, with corresponding improvements in antimicrobial resistance and adverse events, and without compromise of short-term clinical outcomes ¹⁴. This information should be emphasized for the physicians, especially the juniors, in the critical care departments, to enhance the potentially pivotal role of clinical pharmacists in auditing and rationalizing the antibiotic use. Similarly, such antimicrobial stewardship program has been successful in Hong Kong, as it improved the pattern of prescription of antibiotics in the hospitals ¹⁵.

Although the rate of physician acceptance was higher in other departments, we expect that more contribution of the clinical pharmacists in the proper choice and dosing of antibiotics can lead to better utilization of those important drug classes. The matter of physician-pharmacist relationship should be also expanded in the curricula of both Medical and Pharmacy Colleges, in order to ensure the harmony and synchronization among members of the health care team.

CONCLUSION

Strict guidelines and valid policies should be implemented in hospitals to decrease the antibiotic misuse and decrease the risk of microbial resistance against the current known antibiotics. The study confirms that there is a misuse of antibiotics in hospitals and that the physician needs to follow strict guidelines to prescribe antibiotics. Also, the study revealed that the acceptance of physicians to the pharmacist recommendations is low while it should be taken in consideration when prescribing antibiotics to the patients.

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