

Evaluation of Generic Antibiotic Usage from the Perspective of Drug Cost

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Abstract

Introduction: The drug costs are the biggest expense item among health expenditures. Increasing the use of generic drugs is the most important solution for decreasing costs. Antibiotics, with an 18.1% rate of prescription, are the most used pharmacological group worldwide. This study aims to calculate the original/generic drug costs of antibacterial agents prescribed to hospitalized patients in a university hospital.

Methods: During 13 month-period prescribed drugs to hospitalized patients were recorded with the product names and amount, and drug costs were determined for the three active agents most commonly prescribed in the antibacterial group.

Results: The total number of prescriptions was 337.462 during the 13-month-period and 46.3% of them were antibiotics. Among them, 94.4% were antibacterial agents. In the subgroup analysis, cephalosporin group of antibacterial agents was the most frequently prescribed. On the contrary, amoxicillin+sulbactam was found to be the most frequently prescribed active substances within the top 100 prescription drugs. When prescription details were evaluated, generic forms of active substances were more frequently prescribe than the original drugs. From the point of drug costs with the use of generic drugs for 13 month-period, the total saving was about 31%.

Discussion and Conclusion: It is projected for 2023 that the proportion of drug costs in health expenditures will reach 25% in our country. When this data is taken into consideration, the usage and prescription of generic drugs should be encouraged. Establishing generic drug promotion policies, accelerating the regulatory processes of generic drugs, including generic drugs in reimbursement lists, without delay will increase the demand for generic drugs and contribute to the reduction of drug costs, which constitutes the most important part of health expenditures.

Keywords: Antibiotic; drug cost; Generic medicine.

When the main purpose of the economic analysis is to determine the priorities in the field of the health sector, different components of the health system (management-financing, service provision, service delivery) face us. The main priority of the management and financing mechanisms undertaken by the state is the proper and fair allocation of available resources in the framework of the needs of the society and the gains to be achieved. Increasing health expenditures make it difficult to allocate finance to the health sector, and on the other hand, requires making serious economic evaluations in determining the priorities for the allocation of these limited resources. A survey conducted in the United States shows that the share of health care expenses to be allocated in 2030 will account for 30%

of production revenue [1]. Similarly, health expenditures in Turkey increased by 14.5% in 2016 and reached 119 billion 756 million TL [2] and the ratio of health expenditures to the gross national product was 4.3% [3].

Industry's share in the provision of health care is undeniable. When evaluated concerning the medical treatment data published in March 2018, 20,197 licensed drugs belonging to nearly 90 pharmacological/therapeutic drug groups are available in Turkey [4]. The higher number of licensed drugs is mainly due to a large number of generic preparations having the same active substance. This phenomenon is reflected in that there are many medical treatment alternatives for clinical use. For example, when considered for beta-lactams, a specific group of antibiotics; nowadays, an

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infectious disease specialist has 180 different beta-lactam group antibiotic preparations to be chosen for the treatment of infection [4]. The role of treatment costs, as well as basic parameters, such as suitability for the patient, efficacy and safety of the drug, are of paramount importance in drug selection. Thus, in recent years, comprehensive clinical studies have included cost-effectiveness and cost-efficiency analyzes in addition to evaluating the efficacy and safety of the drug [5, 6]. These studies, called pharmacoeconomic evaluation, aim to use healthcare resources effectively [7].

Given that the increase in employment in the health sector is not parallel to the increase in population and the increasing health expenditures necessitate the standardization of diagnosis and treatment methods. The aim of standardization is to determine the effectiveness, safety and cost of treatment in the light of existing clinical and economic data and establish patient management strategies in treatment centers [8, 9]. Standardized treatment ensures that appropriate and effective treatment is to be given to the patient at the lowest cost [8].

Drug costs constitute the biggest item of treatment costs. From an economic point of view, one of the most important solutions to reduce drug costs is to increase the use of generic drugs. This is particularly important for the government and private insurance institutions that cover pharmaceutical costs.

Antibiotics take first place among the drugs used in hospitals in Turkey with a drug usage rate of 20-50% [10]. Again, the pharmacological treatment group with the highest generic drug use among drugs reimbursed by the government is antibiotics, with a rate of 79.8% [10].

This study aims to determine the original and generic drug costs for antibiotics prescribed at Istanbul University Istanbul Medical Faculty Hospitals.

Materials and Methods

Collection and Classification of the Data

The prescriptions written to inpatients and sent to the hospital pharmacy during the thirteen-month period were recorded in the Excel 2016 program with the names and doses of the pharmaceutical preparations. The pharmaceutical preparations were first classified according to pharmacological groups they belonged. After preparations evaluated in 13 different pharmacological groups were classified according to the names of their active substance, their prescribing frequencies were determined in the original/generic subgroups [11].

Calculation of the Drug Costs

In the calculation of drug costs, the unit drug price was de-

termined in consideration of the pharmacy's sale price for the preparations available at the hospital pharmacy. For the pharmaceutical preparations which are not available in the hospital pharmacy, it was determined by adding the hospital pharmacy contribution over the tender price of that preparation. To evaluate the effects of original and generic drug use on cost, the first three antibiotics containing the mostly prescribed active substance were considered. The reduction in drug costs was calculated for the three antibacterial groups (cephalosporin, combination with inhibitor and carbapenem) based on the most frequently prescribed active substance in these groups according to the following formula:

$$\%F = \frac{(\text{OBF} \times \text{N}) - (\text{JBF} \times \text{N})}{(\text{OBF} \times \text{N})} \times 100$$

%F= % Meduction in cost

OBF= Unit price of the original preparation

JBF= Unit price of the generic preparation

N= Total number of drugs prescribed (original+generic)

Results

Prescription Frequencies of Pharmacological Groups

A total of 768.573 prescriptions were examined during the thirteen-month period (September-October). When these prescriptions were examined excepting parenteral preparations, a total of 337.462 prescriptions were examined. When these prescriptions were examined according to various time intervals, the findings showed that prescriptions were most frequently written between September-December (incl.) (Fig. 1).

The distribution of prescriptions, according to pharmacological groups, is shown in Figure 2. Among other medications, most frequently chemotherapeutic agents were written at a rate of 46.3% (156,418 preparations).

When subgroup analysis for chemotherapeutic drugs was performed, 94.4% of these prescriptions were made up of antibacterial agents (147,595 preparations). The remaining 4.6% of the preparations consisted of antifungals (2.8%: 4520 preparations), antineoplastic (1.9%: 2980 preparations), 0.8% antiviral (1291 preparations) and 0.02% anti-helminthic agents (32 preparations) (Table 1). In the antibacterial subgroup analysis, the most commonly prescribed three groups were cephalosporin (47%; 43637 preparations), its combination with an inhibitor (43%; 39198 preparations) and carbapenem (10%, 92672 preparations) (Fig. 3).

When evaluated based on active substance, ceftriaxone (3183 preparations) in the cephalosporin group, ampicillin-sulbactam (37762 preparations) and imipenem (5783

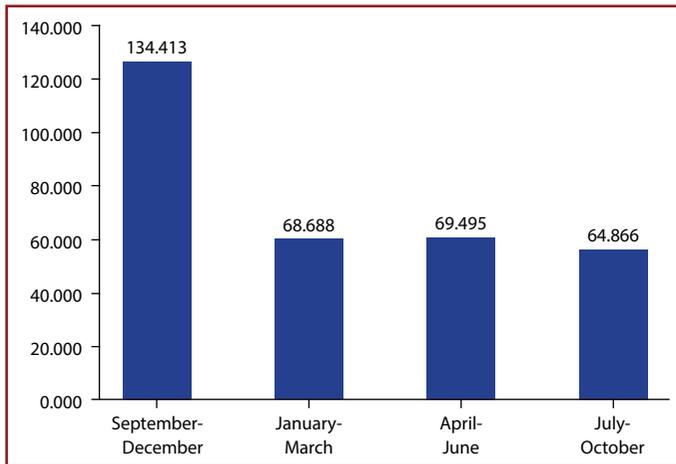


Figure 1. The number of prescriptions and their distribution according to certain periods.

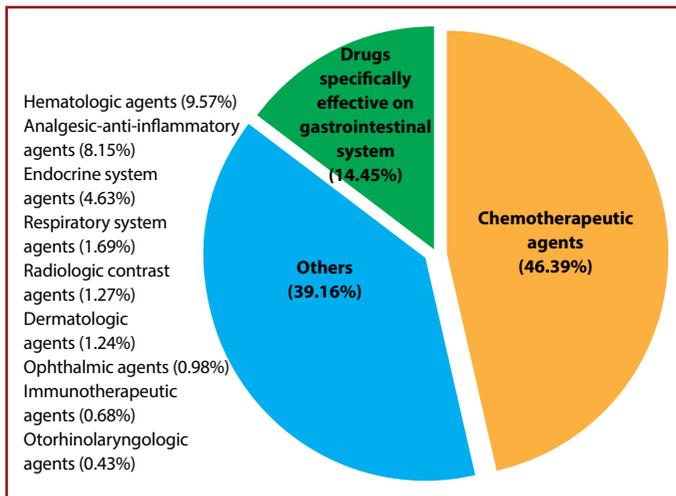


Figure 2. Distribution of the prescriptions according to pharmacologic groups.

preparations) in carbapenem group were the most commonly prescribed active substances (Table 2). Ampicillin-sulbactam combination was also the most frequently prescribed preparation among antibacterial agents.

Original/Generic Drug Prescription Rates

The frequency of prescribing original/generic drugs was studied for the three most commonly written antibacterial agents. Accordingly, it was found that generic forms were prescribed more than the original drugs (total prescription rates of 11438 and 35290 for the original and generic drugs, respectively). In these groups, based on their active substances, five different generic formulations for ampicillin + sulbactam combination and six different generic combinations for ceftriaxone were determined. The generic formulation was not prescribed for the imipenem active substance (Table 3).

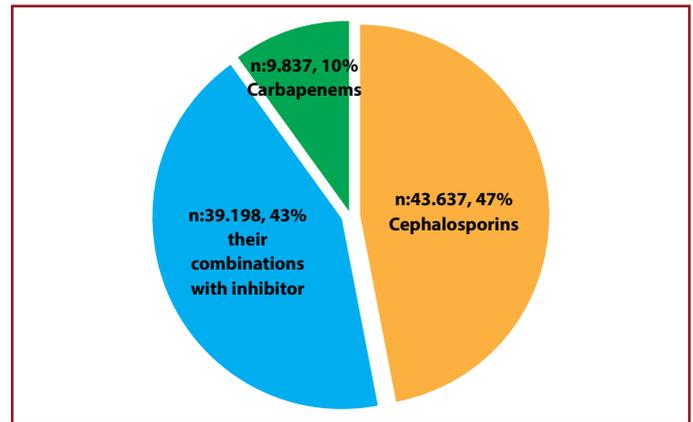


Figure 3. Frequency of the prescribing antibacterial groups.

Table 1. Frequency of prescribing chemotherapeutic agents

Groups	n	%
Antibacterial	147,595	94.4
Antiviral	1,291	0.8
Anthelmintics	32	0.02
Antifungal	4,520	2.8
Antineoplastic	2,980	1.9
Total	156,418	100

Table 2. Frequency of prescribing drugs based on their active substances

Antibacterial group	Active substances	Number of prescriptions
Combination with an inhibitor	Ampicillin -sulbactam	37,762
Cephalosporin	Ceftriaxone	3,183
Carbapenem	Imipenem	5,783

Drug Costs

The total drug cost for the three most frequently prescribed active substances was 1210442 TL and 732473 TL of this amount consists of the original drug costs. Generic drug cost was found to be 477,969 TL. The decrease in the cost of the drugs with the use of generic drugs over a total period of 13 months was calculated as 31.3% (Table 4).

Discussion

Currently, as the state's leading social responsibility, one of the most important factors in creating a healthy society and maintaining a healthy life is to produce the drug according to relevant valid rules and deliver it to everyone in need [12]. On the other hand, the increasing share of the state budget allocated to health services necessitates measures to be taken for the production, consumption and reimbursement of the drug, which is an important component of leading a healthy life. Indeed, according to the 2016 data of Turkey

Table 3. Frequency of prescribing original-generic preparations based on their active substances

Antibacterial group	Active substances	Number of prescriptions		
		Original	Generic	Total
Combination with an inhibitor	Ampicillin-sulbactam	4.359	33.403	37.762
Cephalosporin	Ceftriaxone	1.296	1.887	3.183
Carbapenem	Imipenem	5.783	–	5.783
	Total	11.438	35.290	4.6728

Table 4. Drug costs

Antibacterial group	Active substances	Drug cost (TL)		Reduction in drug cost (%)
		Original	Generic	
Combination with an inhibitor	Ampicillin-sulbactam	39.076.68	42.799.91	14.99
Cephalosporin	Ceftriaxone	110.114.27	49.969.22	74.60
Carbapenem	Imipenem	583.281.64	–	–
	Total	732.472.63	92.769.13	31.30

Statistical Institute (TSI), per capita, health expenditures in Turkey increased by 13.3% to 1524 TL, and 78.5% of health expenditures were met from the general government budget [2]. The Pharmaceutical Industry Employers' Association (IEIS) foresees that the share of health expenditures in the gross national product will increase to 6.8% in 2023 [13].

Pharmaceutical expenditures are among the leading items in health expenditures. According to TURKSTAT data, pharmaceutical expenditures reached 22.1 billion TL in 2016, [2] and the share of pharmaceutical expenditures in health expenditures is expected to reach 25% in 2023 [13]. Antibiotics occupy a second place among the treatment groups, with a rate of 16.7% [2]. In line with this consumption rate, according to IEIS data, 50 (13.9%) of the 359 drugs entering the pharmaceutical market within the first nine months of 2017 were antibiotics [14]. Among the drugs used in hospitals around the world, antibacterial agents are in the range of 20-50%, and according to the frequency of inpatient prescribing rates, antibacterial agents rank first with a prescription rate of 18.1% [9].

With rational drug policies, developed countries ensure both the development of the pharmaceutical industry and the delivery of high-quality and effective drugs to the patient in the best and most economical conditions [15]. Among these policies, reference pricing and generic drug use are the two most effective tools, particularly in controlling drug expenditures [16].

In this pilot study, we demonstrated that generic drug use resulted in a 31.3% reduction in drug costs over 13 months. The data of IEIS support our results. In the related report, the average unit price for 77 original products entering the

pharmaceutical market in the first nine months of 2017 was 32.2 TL, and the average unit price for 282 equivalent products was 7.47 TL [7].

In addition to saving on the health budget with the use of generic drugs, supporting generic drug production in the pharmaceutical industry will increase the competition by allocating more funds for Research and Development (R & D) activities and encouraging the establishment of new pharmaceutical companies and thus the growth of the pharmaceutical market. In India, where drug development has become a state policy, the export of equivalent drugs and active substances, which amounted to 200 million dollars previously, has reached 3 billion dollars in 13 years [17].

Similarly, according to 2017 report of Pharmaceutical Industry Employers' Union (IEIS) within the first 9 months, drug sales in hospitals, and pharmacies reached to 17.9 billion Turkish Liras or 1.6 billion number of boxes sold in Turkey's pharmaceutical market, which when compared with data from 2016, represented increases of 19.3% concerning value, and 2% in number of boxes of drugs sold [7]. The main factors driving this growth are the large share due to the increasing number of new drugs entering the market. According to the data of the IEIS, 77 of the new drugs entering the market within the first nine months of 2017 were original, while 282 of them were generic preparations [7].

Given the benefits listed above, the promotion of generic drug use becomes important. Given that at the 55th General Assembly of the World Health Organization in May 2002, it was stated that the competition provided by generic drugs is one of the most effective methods in terms of sustainable price reductions [13]. As a result of the work and recommendations of the EU, Pharmaceutical Working Group

called G10, which was established to promote generic drug use among the European Union (EU) Countries, a large number of EU countries have developed incentive policies to increase the use of equivalent generic drugs by supporting the prescription of generic drugs.

These policies are directed to physicians and pharmacists in the health service delivery stage; and to the patients as receivers of health care. While incentives for physicians consist of prescription follow-up and budget incentives, the most important incentive for pharmacists is to award them for generic drug substitution. Incentive policies for patients include information campaigns and the regulation of incentives in favour of generic drugs. As a result of these policies, the market share of generic drugs is 27% on average, and generic drug use saves about 13 billion dollars annually in 15 EU countries [13]. As of 2009, measures have been taken in Turkey for rational drug use.

Although the drug budget was markedly relieved on the value basis (14.4% and 10.5% of the number of the boxes of drugs prescribed, for 2009 and 2015, respectively) thanks to the improvements in price policies and domestic production opportunities, antibiotics remain to be the second mostly prescribed drug group. Thus, measures for rational drug use maintain their importance for the sustainability of these improvements in the medium and long term [18]. To increase efficiency in drug expenditures, institutions that set the reimbursement policy need to closely monitor technological developments at the global level and provide the necessary flexibility to implement them.

Conclusion

In conclusion, the use of generic drugs significantly reduces the cost of the drugs compared to the use of the original preparations. Similar to the practices in the European countries, measures, such as the establishment of generic drug incentive policies for physicians, pharmacists and patients, acceleration of the licensing process of equivalent drugs, and the introduction of equivalent drugs into the reimbursement lists without delay, increasing the demand for equivalent drugs will contribute to the reduction of drug costs which is the most important item that increases health care expenditures. Furthermore, with the support of generic drug production, Turkey can become a country that exports pharmaceutical products to many developed markets, including the USA and the countries of the European Union.

Ethics Committee Approval: The study data were collected within the scope of the study to determine the therapeutic groups of drugs prescribed to inpatients with the request of Istanbul University Istanbul Medical Faculty Hospital Management.

Permission has been obtained from the Hospital Management for the use of the relevant data.

Peer-review: Externally peer-reviewed.

Conflict of Interest: None declared.

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