

# Rational Prescription of Drug in Iran: Statistics and Trends for Policymakers

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### Abstract

**Background:** Medicine is considered as strategic goods worldwide and, therefore, a huge amount of health care budget is spent on it. To prepare universal access to appropriate health services and achieve the health-related millennium development goals, rational use of drugs is an essential goal in the health system. This study aimed to investigate the proportion of drug prescription in three categories of injections, antibacterials agents and corticosteroids in a 10 year period.

**Methods:** This is a descriptive study using data from an Iranian national insurance organization and National Center of Drug Use. The data about prescribed drugs during 2003 to 2013 were collected and analyzed by Excel Microsoft software, version 2010.

**Result:** Results indicated that injections were decreased from 49.25% in 2003 to 46% in 2013; also, antimicrobials had a decrease from 64.25% in 2003 to 42.2% in 2013. Totally, it was reduced about 16% in the period of 10 years. Corticosteroids increased 10 % from 13% to 23% in 2013.

**Conclusion:** According the present findings that indicate irrational and increasing use of corticosteroids and antimicrobials, it seems necessary for Iranian policy makers to pay specific attention to customizing clinical and pharmaceutical guidelines along with improvement of medical education system and rational prescription, holding scientific committees of prescription supervision, arranging continuous and effective education of health personnel, and improving public culture and community education.

**Keywords:** Injections, Antimicrobials, Rational prescribing

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### Introduction

Medicine is considered as strategic goods worldwide and, therefore, a huge amount of health care budget is spent on it (1). Meanwhile, to prepare universal access to appropriate health services and achieve the health-related millennium development goals, rational use of drugs is an essential goal in the health system (2).

However, 20%-40% of the health budget in developing countries and 10-20% in developed countries is allocated to drugs (3). Inadequate training of health personnel, lack of continual education and monitoring, and lack of up to date or trustworthy data are considered as the influential factors of irrational prescription and consumption of medicines. Irrational drug prescription includes prescription

of numerous drug items, prescription of irrelevant items in relation to the disease, prescription of doses more or less than necessary, irrational prescription of antibiotics, unnecessary prescription of injections, drug interactions, and drug prescription without mentioning the appropriate method of application (4).

The WHO conducted researches reveal that prescription and consumption of some drug items are uncontrolled and irrational. The conference held in Nairobi in 1985 was a beginning to encourage rational prescription of drugs. Afterwards, the WHO and other international organizations started to review the issue with an emphasis on developing countries (5). WHO has made efforts to develop and improve the rational drug consumption through international network for rational use of drugs (INRUD). Some

indices developed by the two organizations include excessive use of antibiotics and injections (6-7).

Delivery of pharmacological services to the patients is very important in the delivery of health services in Iran due to economic, social and cultural factors, drug treatment is considered as the main choice of disease prevention and treatment so that it rarely happens that a patient does not receive medications during hospitalization. Likewise, the majority of facilities, human and financial hospital resources throughout the country are allocated to provision, restoration, distribution, and prescription of medicines (8).

Statistics show the average drug prescription rate in Iran twice as much as the international standards (9). The ministry of health statistics show that some drugs as dexamethasone and cefixime are prescribed irrationally. Dexamethasone is a corticosteroid that may be associated with side effects on the gastrointestinal system, eyes, bones, and cardiovascular system and may produce adverse psychological effects (10). Also, the results of a study in North Africa revealed the average amount of injections to be about 3.2 (11).

Injections are among the most common treatment processes. 16 billion injections (about 95% of health care) are prescribed annually in developing countries as well as Iran. In the most regions of the world, injections are done more than needed irrationally. In some circumstances, 9 out of 10 patients receive injections and more than 70% of them are unnecessary or could have been prescribed for oral administration (3). The researches reveal that many antibiotic treatments have been unnecessary and the problem has been more observable in private as compared to public sectors (12).

Issuance of guidelines and designing educational courses for promotion of rational drug prescription have been implemented by the WHO long before. In Sidney and Thailand conferences were held in 1995 and 1997, respectively, operational strategies for drug consumption improvement in developing countries were reviewed. Among them, evaluation of drug consumption pattern, determination of problems, pharmacist and physician education, and monitoring of the activities could be considered (13).

Although WHO criteria are considered as a guideline to drug prescription, the results of a study show the possibility of their inadequacy and the need for developing new ones (14).

Considering the above points and outcome of irrational drug prescription, precise determination of prescription items is a reliable basis on which policy

makers could take decision. It is obvious that Iran is no exception in this regard. This study was conducted to review the prescription rate in three categories in terms of injections, antibacterial, and corticosteroids.

## Methods

This was a descriptive study conducted in 2015. The study population included all data of prescriptions during 2003 to 2013 in two basic insurance companies all over the country consisting of Social Security Organization (SSO) and Iran Health Insurance Organization and data bank of Iranian National Center of Drug Use affiliated with Ministry of Health and Medical Education.

Considering the aim of the study, we comprehensively reviewed the prescribed medicine and since the mentioned companies cover the most of the population, we applied census method through which all prescriptions in the period of time of the companies were included. Due to the intricacy and importance of rational utilization of drugs, the inclusion criteria were in terms of the three categories of drugs including injections, antibacterials and corticosteroids according to ATC codes and the others were excluded.

In order to collect the data, we used a data gathering form in our study. The designed form included the number of prescribed items in each prescription, number of injection medicines, number of antibacterials, and number of corticosteroids in a study period of January 2003 till December 2013.

After coordination with the competent authorities and statutory licenses, data gathering forms in predefined Excel templates were submitted to all public and private/community pharmacies both inpatients and outpatients and the completed forms from pharmacies across the country were received as a compact disc with the original manuscript sent to the relevant insurance organizations.

In order to verify the electronic versions, we reviewed the original copies of the prescriptions. Also, original versions were studied to match electronic files sent from pharmacies. On average, 59000 prescriptions (0.1%) per year were excluded due to errors including irrelevant items regarding specialty field of the physician, drug and patient mismatch, e.g. prescription of Lidocain vaginal gel for a 2 year old boy, etc.

To analyze the data, we assessed all the incoming files; after making sure about the exact completeness they were classified by Excell software version 2010. Furthermore in order to distinguish between drug groups, Microsoft Excel software was applied to tabulate the data and prepare appropriate graphs.

## Result

In this study, the data were reported from 2003 to 2013 and in each year about 59 million prescriptions were studied. The average of prescribed items in each prescription based on the decade of the study is shown in Table 1. As it is obvious, this rate had a decreasing trend from 2003 to 2013 (the most prescribed drugs occurred in 2003 and the least in 2013).

Injection medicines had a decreasing trend of 49.25% from 2003 to 46% in 2013 and this continued up to 2012. Afterwards, it increased from 33.9% to 44% from 2009 to 2013. Overall, a reduction rate of 5% was observed in prescription of injection medicines (Table 1).

Also, antimicrobials had a slight decrease from 64.25% in 2003 to 66% in 2009. This trend continued up to 2013 and reached 42.2%. About 16% of this drug category shows a decreasing trend (Table 1).

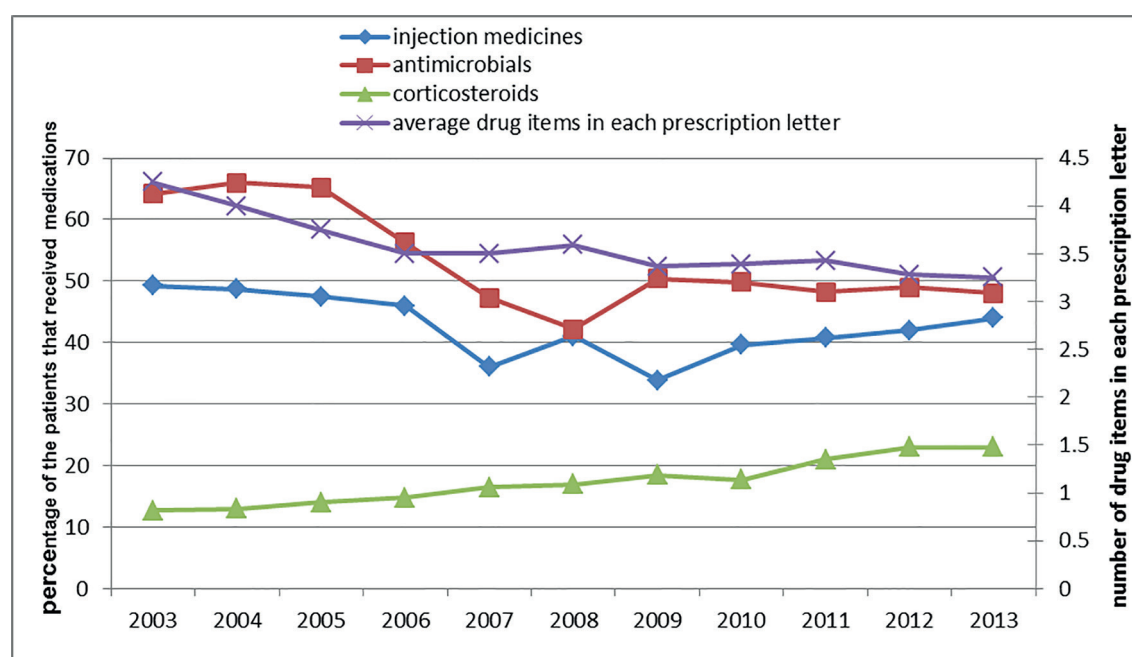
Prescription rate of corticosteroids increased from 13% in 2003 to 23% in 2015. The average prescribed items decreased from 4.25% in 2003 to 3.50% in 2012 and then with some fluctuations it reached 3% in 2014. It is noticeable that the percentage of prescribing antimicrobials has been higher than other variables (Figure 1).

## Discussion

Stablishing a rational and scientific prescription system is one of the main objectives of all health centers worldwide. Optimizing the drug consumption methods and moving to a society with appropriate, risk-free, efficient and quality consumption are the core content of executive measures and WHO recommendations throughout the world. One of the appropriate methods of evaluation of drug

**Table 1:** Prescribed drugs in Iran from 2003 to 2013

Year	Injection		Antimicrobial		Corticosteroid		Items of each prescription letter in average (%)
	Frequency	%	Frequency	%	Frequency	%	
2003	29060500	49.25	37100000	64.25	7500000	12.68	4.25
2004	28770000	48.75	38950000	66	7600000	13	4
2005	27660000	47.25	38500000	65.25	7800000	14	3.75
2006	26500000	46	33200000	56.25	7900000	14.75	3.50
2007	21250000	36	27900000	47.25	9700000	16.5	3.50
2008	24200000	41	25000000	42.2	9900000	16.9	3.59
2009	20000000	33.9	29700000	50.38	10900000	18.5	3.38
2010	23400000	39.61	29400000	49.83	10400000	17.69	3.39
2011	24000000	40.75	29000000	48.22	12400000	21.04	3.43
2012	24780000	42	29200000	49	13500000	23	3.28
2013	25960000	44	28900000	48	13500000	23	3.25



**Figure 1:** Drug prescription trend in Iran from 2003 to 2013.

prescription is recommended by this organization that could be implemented for functional problems regarding drug consumption in the health centers (15). The number of items in each prescription, percentage of prescriptions containing antibiotics, and the percentage of prescriptions containing injections are among the parameters that have been considered by WHO as indices for evaluation of prescription performance of practitioners (5).

As revealed in this study, the prescription of injection products in a ten year period is associated with fluctuations and at the end of the period (44%) it reaches a reduction rate of more than 5% in comparison with the beginning (49.25%), but it is far from WHO standards. According to the WHO standards, the authorized range of prescription of injection medicines is from 10 to 17 percent (2). A study conducted in 1999 in 5 northern, central, eastern, western and southern regions of Tehran showed that 39% of prescriptions contain injection medicines. According to a review conducted by the WHO in 1993, the percentage of injection medicines in Ecuador, Nepal, Nigeria, Tanzania, Bangladesh, India, Soudan and Yemen was 17, 5, 37, 27, 0.2, 17, 36, and 25, respectively (1). In the study of Mosleh et al. in 2010 in the pharmacies of the health centers affiliated with Tehran University of medical sciences, the percentage of prescription letters containing at least one injection item was equal to 28.96 (16, 17). In the study by Sepehri et al. that was conducted in Kerman, injection medicines were prescribed in 42.4% of the letters. The results of a study conducted by Zare et al. in 2010 in Shiraz revealed that the most common prescription items were injection medicines (58.8) (18). A study in 2013 in Yemen indicated that 46% of prescriptions consisted of injection medicines (19). In a study in Nigeria, the percentage of prescriptions containing injection products was estimated to be 4% (8). Its low level may be due to the fact that the study was conducted in a tertiary hospital.

Fluctuations in prescription of injection items in the mentioned time period needs additional reviews because, on one hand, beliefs and cultural patterns of people and practitioners regarding the effectiveness of prescription and application of these drugs could be different between the two groups as the elderly believe that injection items cause more rapid relief while the new generation has no passion for it. On the other hand, disease prevalence could be effective on the treatment strategies and prescription methods regarding selection of medication. For example, prevalence of cholera in a year may be the cause of increased prescription of injection medicines in order to control the epidemics.

Prescription of antibacterials as the members of the family of antibiotics had fluctuations in the ten year period of this study, but the statistics in the beginning of the period in year 2003 (64.25%) in comparison with the end of the year 2013 (48%) reveal remarkable reduction of more than 16 percent which could be due to a variety of factors including increased patient information and lower drug demand, increased level of physician's knowledge regarding more rational prescription patterns, increased prices, etc. However considering the WHO standards, prescription of these items is still higher than the reference values of 20-25.4 percent (2). The study conducted in 1999 in 5 regions of Tehran revealed that 43% of prescriptions contained antibiotics (16). According to a review by the WHO in 1993, the percentage of prescriptions containing injection medicines in Ecuador, Nepal, Nigeria, Tanzania, Bangladesh, India, Soudan, and Yemen was 48, 43, 27, 39, 63, 43, 31, and 46, respectively<sup>16</sup>. A study that reviewed rational drug administration in 12 developing countries reported antibiotic items as 47.5 to 100 percent. In a study in UAE in 2012, the percentage of prescriptions containing antibiotics was estimated 31.1 (23). In another study in a Dubai hospital in 2010, the percentage of letters containing antibiotics was reported as 21.4% (23). The lower levels in this study could be due to the limited field of study.

Excessive use of antibiotics could be associated with severe clinical problems as drug resistance, extraordinary and widespread infections, allergies and other health risks (24). Scientific reviews have reported inappropriate antibiotic consumption worldwide. It could potentially cause drug resistance and necessarily increased usage of more expensive ones in order to treat usual and life threatening diseases (25). Microbial resistance is rapidly turning to a health dilemma worldwide, especially in developing counties<sup>3</sup>. Therefore, problem-based learning in drug treatment, application of necessary national medications list and standard treatment guidelines as a key intervention for improvement of prescription process is recommended (14).

The results of this study revealed that the growth has doubled for steroids in a period of ten years (12.68% in 2003 in comparison with 23% in 2013). Although in comparison with injection medicines and antibiotics, this group of medicines has a lower prescription rate, the growth rate of about two times in the country could be alarming. In the study conducted by Sepehri et al., corticosteroids were prescribed in 11.17% of the prescriptions (17). The lower rate of the index could be due to the environment and the studied sample which was confined to only one province and also the

prescriptions made by general practitioners.

According to this study, the average number of prescribed medications in each letter has shown a considerable decreasing order (4.25 in 2003 as compared with 3.25 in 2013). However, it is far from global standards. The study conducted in 1999 in 5 regions of Tehran showed the average items in each prescription letter to be 3.6. In the study by Mosleh et al. in 2010 in the pharmacies affiliated with the health centers affiliated with Tehran University of medical sciences, the average prescribed items have been estimated as 2.85 (16). In the study of Mohagheghi et al. that evaluated the effect of education, the average drug items decreased from 4.3 to 3.6 in a 6 month period (28).

In Iran, prescription suffers qualitative and quantitative insufficiencies. The quantitative insufficiencies include the high level of items in each prescription (3.5 items). The quantitative issues include high percentage of injection items, antibiotics, drug interactions, lack of a description about the method of administration, and illegible prescriptions (29). Irrational prescription is a problem involving developed and developing countries. This is associated with a variety of substantial financial and health related harms. Different measures have been taken to resolve this issue (10). It seems that education is an important and essential factor and must be prioritized in the process of prescription improvement. In Iran, different educational programs for graduated practitioners have been designed as continuous education, but the review of articles shows that qualitative and quantitative prescription indices in Iran have not met the expectations. In spite of considerable defects regarding rational prescription indices in Iran, a definite educational program for medical students does not exist. The study reveals that considering a prescription course in medical curriculum is a necessity and it is essential for curriculum designers take this point into account (30).

This study had some limitations as follows: the data belonging to arm force insurance organization could not be included because of the security of the information; also, the study was restricted only to three categories of medicines, injections, antibacterials and corticosteroids, because of the limitations of time that can be improved in the future studies.

## Conclusion

According to the present findings that indicate the irrational and increasing use of corticosteroids and antimicrobials, it is necessary for Iranian policymakers to pay specific attention to customize clinical and pharmaceutical guidelines along with improvement

of the medical education system and rational prescription, formation of scientific committees for prescription supervision, continuous and effective education of the health personnel, improvement of public culture and community education while considering "prevention before treatment".

**Conflict of Interest:** None declared.

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