

The Dilemma of Irrational Antibiotic and Corticosteroid Prescription in Iran: How Much It Can Affect the Medicine Expenditures?

Parisa Mehdizadeh¹, Nooredin Dopeykar², Mohammad Meskarpour-Amiri¹, Hediyyeh Zekri³, and Mahmoud Salehi²

¹ Department of Health Economics, Health Management Research Center, Baqiyatallah University of Medical Sciences, Tehran, Iran

² Research Center for Prevention of Oral and Dental Diseases, Baqiyatallah University of Medical Sciences, Tehran, Iran

³ Department of Management and Health Economics, Tehran University of Medical Sciences, Tehran, Iran

Received: 16 Jan. 2017; Accepted: 18 Apr. 2017

Abstract- In recent years the high cost of medicines and the lack of it were one of the major problems in developing countries that despite numerous efforts to solve the root causes of this problem, the issue remains, unfortunately. Therefore, this study aimed to assess the impact of antibiotics and corticosteroids prescription on the medicines expenditures. This was descriptive-analytical study that conducted to assess the function of medical expenditures through prescription letters and analysis the factors affecting medicine expenditures. We used the data of 91,994,667 selected prescription letters that were collected by the Ministry of the Health and Medical Education (MOHME) throughout the country in the year 2011 which was analyzed through a logarithmic regression model and OLS estimator. The average number of prescription items in each prescription letter were varied from 2.7 to 3.6, and the average price of each letter was varied from 30223 to 69986 Rials. Between 39 to 61 percent of prescription letters containing antibiotic items and between 15 and 35% of them contain corticosteroids. Also, the impact of antibiotic and corticosteroid prescriptions on the average expenditure of prescription letters were -1.4 and 0.032 respectively. Excessive and irrational prescribing had the greatest impact on medicine expenditures. On the other hand, the expenditure of prescription letters had the negative elasticity to antibiotics prescription and relatively inelastic for corticosteroids. So, raising the price of medications to reduce the use of them could not play a successful role in a control policy.

© 2017 Tehran University of Medical Sciences. All rights reserved.

Acta Med Iran 2017;55(10):628-635.

Keywords: Prescription; Antibiotic; Corticosteroid; Medical expenditure; Health policy

Introduction

Access to health care for the purpose of providing, protect and promoting the health services for people was one of the most important factors that are indicating progressivity and developing level of one country (1). Pharmaceutical productions are known as the main component of modern and traditional medical treatments to improve the health of people. Therefore, it is essential that the producing of them were effective, healthy and had good quality and also be available to the public at affordable prices (2). Medicine expenses constitute a major component of health expenditure. So that according to the World Health Organization reports in 2009, Europe Union countries spent on average 2% of GDP for medicines (3). As well as according to the World Bank, Pharmaceutical expenditures were 20 to 50

percent of total health expenditures for developing countries and 12 percent for OECD countries (4).

A steady rise in medicine expenditures increased the total cost of health care system and exposed this sector with continuously budgetary deficiencies and other pressures (5). On the other hand, in the last years, the high cost of medicines and the lack of it because of some economic fluctuation and sanctions (6), were one of the major problems that despite great efforts to solve the root causes of them, unfortunately still exists. Along with all the chronic problems that affected health system and country's pharmaceutical sector for years, the recent years' experience of our country in the face of political-economic challenges and fluctuations proved that our policymakers require concerted and purposeful program to financing pharmaceutical sector in efficient and stable manner, so that prevent disturbance in access to

Corresponding Author: N. Dopeykar

Research Center for Prevention of Oral and Dental Diseases, Baqiyatallah University of Medical Sciences, Tehran, Iran
Tel: +98 21 82483172, Fax: +98 21 88989129, E-mail address: n.dopeykar@gmail.com

medicines in various situations (7,8). One of the factors that are affecting the stability of pharmaceutical financing and the efficient utilization of limited health budgets was considering the rational use of medicines and other health technologies. Several studies have shown that prevalence of irrational prescribing and use of health interventions could lead to increased direct and indirect health expenses (9). Uncontrolled and excessive prescribing of antibiotics and corticosteroids, a large number of prescription medicines in prescription letters and high prevalence of injection medicines in non-essential cases, are the items that Considered in the scope of monitoring rational use of medicine in the world (10). From economic point of view, it has been estimated that the costs of treatment by antibiotics had about 40 billion \$ in 2000, that about one-third of it was related to developing countries (11). On the other hand increase in antibiotic-resistant species and reduces the efficiency of it, imposed huge expenses to the health system. And since the most incidences in antibiotic-resistant occurred in countries with the highest and irrational use of medicines, so the necessity of new and effective policies to control the excessive use of antibiotics is essential in worldwide (12-14). The Islamic Republic of Iran with an average annual medication consumption growth rate of 11.5% in comparison with the average growth rate of 7% among developing countries and 9% worldwide is one of the countries with the highest consumption rate of medical products (15). Also, the results of the study that conducted on the prescription of corticosteroids in Iran reveals that the consumption of corticosteroids has grown up to two times in a Ten-year period (12.68% in 1999 in comparison with 23% in 2009) (16). So besides the problems that mentioned above, these problems along with other signs of irrational prescribing and over the use of medicine are seen as well as in Iran (17).

The total expenditure of medicines in Iran was about 4 billion \$ per year that without regard to the role of insurance organization, patients out of pocket payments (Out of pocket) consist more than 45 percent of it (7,18,19). According to the study that conducted in five areas of Tehran (northern, central, eastern, western and southern) in 1999 showed that the average prescription items for each prescription letter were equivalent to 3.6 which 43% of it consisted of antibiotics (20). This growth in the use of Pharmaceutical products and excessive and irrational uses were caused that irrational uses problem becomes one of the most important issues of our country. The quality prescription letters and rational use of medicine were one of the major

challenges of Ministry of Health and the Food and Drug Administration in recent years (21). Due to the high amounts of medicine expenses from total health expenditures and also high proportion of households' shares from health spending, it is necessary to assess the impacts of various factors that influencing these costs in our country by using national data so that its results can be useful in designing new policies or modifying programs that previously used. So in this study, we aimed to investigate the direct effects of some variables that related to the rational use of medicines such as the number of medicines per prescription, antibiotics, and corticosteroids prescribing on medicine expenditure in Iran.

Materials and Methods

This research is a descriptive-analytic study that assessing expenditure function of medicines by using 91994667 selected prescription letters and also determine and analysis some effective factors on the expenditures of medicines prescription in Iran.

Data, sampling and data preparation

We do this study by using the data that collected on 91.994.667 selected prescription letters throughout the country by the Ministry of Health and Medical Education (MOHME) published in 2011. The data had been separately collected from 36 cities or provinces with universities of medical sciences. The main variables in this study have been: the total number of medicine that prescribed, the total number of prescription letters containing antibiotics, the total number of prescription letters containing corticosteroids, the average price for each prescription letter. We know the Different groups of medicines were prescribed according to the prescription pattern. Among them, antibiotics and corticosteroids are the two main groups of medicine that prescribed by physicians. So we select these two groups of medicine that were in most prescribed medicines for treatment in order to examine the direct effects of them and some other variables on medicine expenditure in Iran.

Study model

In order to study the relationship between the price of prescribed letters (as the dependent variable) and total number of prescription letters containing corticosteroid an antibiotics and the total number of prescribed medicines (as independent variables), we used a logarithmic regression model. This method provides a

The dilemma of irrational antibiotic and corticosteroid prescription

statistical process to examine the relationships between the study variables. The regression model has been used in previous studies to examine the factors influencing prescriptions and the use of drugs and medicines (22). The main reason for choosing this method in the present study was that this method helps us to predict and forecast how the value of dependent variable change when each of the independent variables are varied. The regression model was as below:

$$\text{Ln (EXP)} = C + \beta_1 \text{Ln (ANT)} + \beta_2 \text{Ln (COR)} + \beta_3 \text{Ln (NOM)}$$

C= Constant Value

Ln= Natural logarithm

Ln (EXP): Logarithm of Mean price of each prescription letters.

Ln (ANT): Logarithm of the number of prescriptions including antimicrobial medicines

Ln (COR): Logarithm of the number of prescriptions including Corticosteroid medicines

Ln (NUM): Logarithm of the Mean number of medicines in each prescription

First, the data were recorded in excel 2007. For descriptive analysis and design diagrams, excel 2007 has been used. Eventually, Eviews 5, special econometrics software, has been used to estimate regression model.

Assessing model performance

In order to assess the validity and the performance of the model, besides the coefficients of the model and statistics such as P , t -Statistic, R^2 , Standard Error, 30/70 validation method was used. In order to do this,

the model was developed with 70% of the total sample and then tested with 30% of remaining.

Study limitations

There were some limitations on the availability of some demographic variables on patient's prescription letters such as sex, age, etc. Also, the kind of physician expertise can be used in the model. Also, the importance of cultural and regional factors on the pattern of physicians prescribing could not be neglected. So that including this factor in analysis or no eliminate the effect of these factors can create difficulties in the analysis of the results. To resolve this problem using panel models with fixed and variable effects can be useful. But in our study, it was not possible due to lack of availability of data from other years. Non-registered medicines (such as OTCs) or medicines that outside the insurance coverage were another limitation of the data that used in this study, which can affect the results.

Results

Results of the study show that the average number of medicines in each prescription letter varied from 2.7 to 3.6 medicines per letter. The average price for each prescription letter varied from 30233 to 69986 RLs in different geographical regions. Figure 1 shows the distribution of the prescription letter expenditures according to different geographical regions.

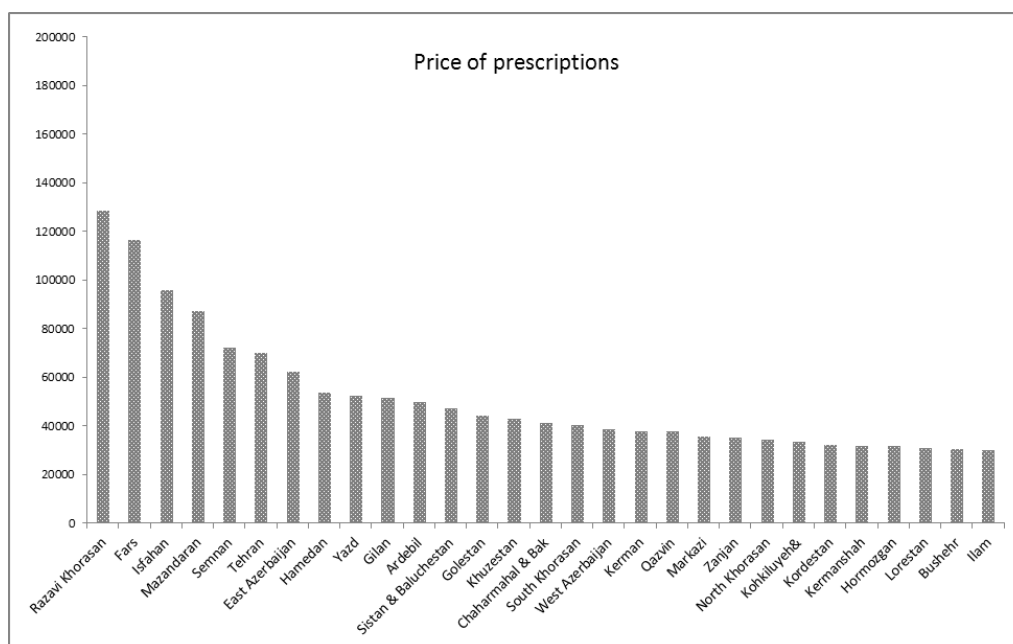


Figure 1. Expenditures distribution of the prescription letter in Iran

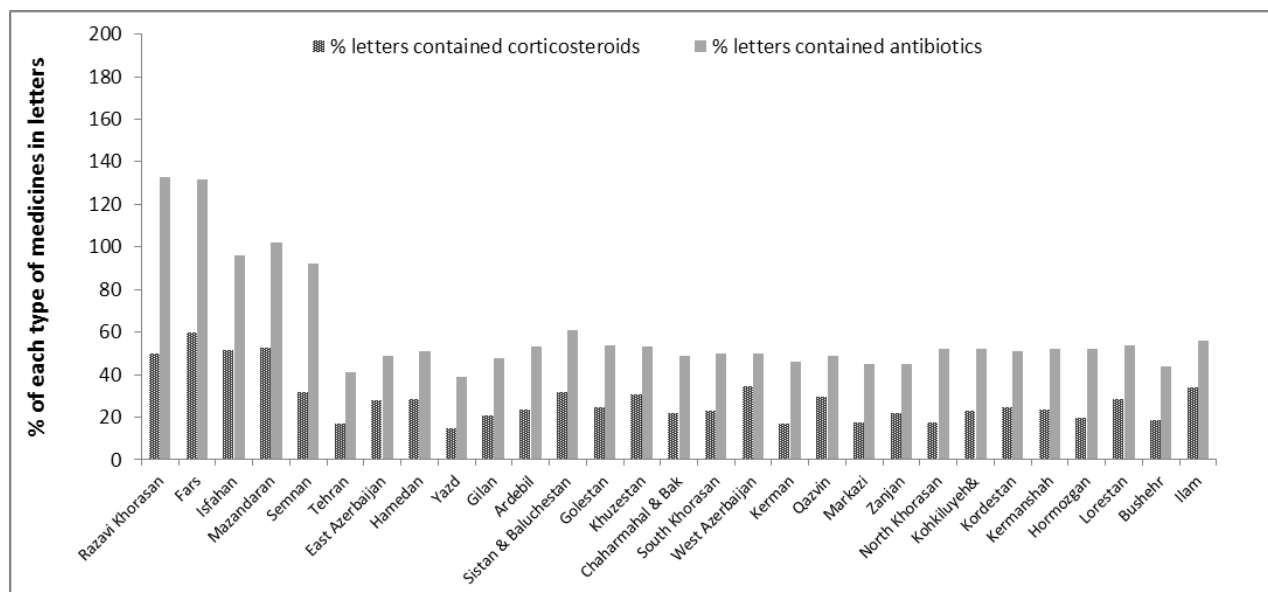


Figure 2. Percent of all prescription letters contained antibiotics and corticosteroids

Also, 39 to 61 percent of all prescription letters contained antibiotics and 15 to 35 percent of all prescription letters containing corticosteroids.

The estimation results for the regression equation by using OLS estimator showed that the impact of Mean number of medicines in each prescription on price was significant ($P < 0.05$) As well as the impact of prescribing antibiotic and corticosteroid items on mean price of each

prescription letters were significant ($P < 0.05$) and equal to -1.40 and 0.032 respectively. Also R^2 statistics was 0.66 that means 66% of dependent variable changes can be justified with independent variables changes. Table 1 shows the estimation results for the regression model of medicines expenditure according to the price of each prescription.

Table 1. The estimation results for the regression model of medicines expenditure

Variables	Coefficients	Standard Error	t-Statistic	P
C	13.52	1.05	12.85	0.000
Ln (ANT)	-1.40	0.36	-3.87	0.001
Ln (COR)	0.032	0.01	1.73	0.047
Ln (NOM)	1.86	0.57	3.23	0.003
R^2		0.66		

Estimation results for regression model equation show that elasticity of medicine expenditure to the prescription of corticosteroids in each prescribed letter was 0.032 that shows relatively elasticity of this kind of medicine to expenditure. On the other hand, elasticity of medicine expenditure to the prescription of antibiotics showed that there was inelasticity among prescription of this kind of medicine to the expenditure of medicines.

Discussion

Indiscriminate use of drugs has been one of the most important problems of our country. Also in the last years, the quality of writing of prescription letters and

rational use of medicine was one of the major challenges in the Ministry of Health and the Food and Drug Administration (19). The results showed that the average number of medicines in each prescription letter varied from 2.7 to 3.6 medicines per letter. This rate is very high compared to the results of other studies conducted in some developing countries and was markedly higher than the WHO's recommended value of 1.3 to 2.0. (World Health Organization, 2004) So that these results show vary high amounts compared to another study that conducted in some developing or under developing countries about average number of medicines in each prescription letters that reported by WHO in 1993. These amounts were higher than those of developing

The dilemma of irrational antibiotic and corticosteroid prescription

countries like Malaysia (1.8), Egypt (1.6), Yemen (1.5), and Palestine (1.3) and were less than some other countries like Indonesia (3.5) and India (3.3) (23). Also a study by Mosleh *et al.*, that was conducted in 2004, for assessing the medication prescription status according to the WHO guideline on the standards of drug prescriptions, revealed that the average prescribed items were equivalent to 2.85 (16) that is consistent with the results of this study.

According to the results of the study 39 to 61 percent of all prescription letters contained antibiotics that this rate considered as the high amount. While according to the previous studies, in many countries, about 30 to 50 percent of prescribed medicines are antibiotics (24). The study that conducted in five areas of Tehran (northern, central, eastern, western and southern) in 1999 showed that 43% of each prescription letter contains antibiotics (20). These results of the study consistent with some other countries like Sudan (63%), but compared to countries such as Bangladesh (31%) is high in use of antibiotics (22). Despite the fact that antibiotics are necessary for most bacterial infections and avoiding from the use of them can be threatening the life of the patients, but most studies indicated that 30 to 60 percent of prescribed medicines were inaccurate and inappropriate, and often these mistakes were done by physicians, distributors or done as self-treatment (24,25). It was estimated that 40 billion \$ of all treatments that attributed to antibiotics in 2000, were in developing countries. So the share of these countries from antibiotic consumption was about one-third overall. This situation shows that despite the attempt to reduce the use of antibiotics, the growth of the antibiotic expenditures (especially in developing countries) was continued (11).

Results showed that 15 to 35 percent of all prescription letters Contains corticosteroid. Previous studies showed that prescribing corticosteroids has grown about twice in Iran over a period of ten years (12.68% in 1999 and 23% in 2009) (16). Corticosteroids were caused by symptomatic treat and extensive use of them causes some adverse effects that could categories in two groups: 1. side effects of continuous use of pharmacological doses and 2. Side effects that are resulting from the abrupt discontinuation of them. Both of them could make dangerous adverse reactions in patients (15,25). It must be noted that prescription and consumption pattern of medicines were varied among different geographical areas. A review of the previous studies in Iran confirms the difference in prescribing the injection medicines in different geographical areas

(20,26). The percentage of prescription letters that contain injection medicine were varied from 27 to 57 percent. Previous studies that were conducted in Iran also confirmed these results. A study that was conducted in five districts of Tehran at 1378 showed that 39% of prescriptions contain injection medicine. Mosleh *et al.*, the study showed that at least one injection item was among 28.96% of prescribed items (16). Choi K-H *et al.*, showed that factors such as having young population, living in the city and a large number of hospital beds, has effects on the prescription of injection medicines (27). Since the prescription of injectable form of medicines is not the best choice for the majority of patients and injection have risk for them (28). So, it is essential to give additional learning for people through mass media, Family physicians and pharmacologists and educational policy in training of medical community to learn more about the risks that are resulting from these pharmaceutical forms.

Based on the results, the price elasticity of prescription letters for prescribing of corticosteroids was less than one and price elasticity of antimicrobials medicines was negative. Goldman *et al.*, studies (22) revealed that medications price elasticity varies from low elastic to inelastic according to medication groups so that the price elasticity for the rheumatoid arthritis medications is low (-0.21) and for the cancer medications are almost none (-0.01). In a report that was presented by Cholle D, Liu S. in 2006, showed that total demand for prescription medicines was inelastic and price elasticity range was determined between 2.9 to 3.2 (28). The studies which were conducted in order to estimate the medicine demand function in Iran showed that the medication is an essential good for families and its price and income elasticity is lower than 1 (29). According to these results we can conclude that since prescription and consumption of injection medicines in Iran is not sensitive to the price, increasing the cost of medicines -as a policy towards reducing the consumption- cannot be successful and might only bring catastrophic health expenditure for the poor households. So, it seems that educational policy could be more effective than price policies.

The results of the estimation of the logarithmic equation in this study showed that the prescription of antimicrobial medication has a negative elasticity to the cost. So that 10 percent increase/decrease in the prescription of antibiotics caused 14 percent decrease/increase in the average cost of prescription letters. ($P < 0.05$). That it could be due to the low price of antibiotics compared to other types of medicines as well

as the impact of insurance coverage in reducing the medicine expenditures in prescribed letters which contain antibiotics compared to other letters; So that patients with insurance coverage were able to provide medicines at lower cost. On the study that was done by Shea *et al.*, in order to estimate the relationship between insurance coverage and the use of prescription medicines in persons who covered by Medicare, showed that persons who are having insurance coverage use prescription medicines more than those without insurance. The researchers found that even the factors such as health status and income were constant; people with insurance coverage basically use more medicine. This is because insurance coverage causes a significant decrease in out of pocket expenditures of patients for prescription letters (30).

According to the results of the estimation of the logarithmic equation, prescription of corticosteroids was lower than 1. So, prescription of corticosteroids is relatively inelastic (not related) of the cost. It means that increasing or decreasing the cost of prescriptions has no significant effect on increasing or decreasing the prescription of corticosteroids (With increasing in the cost of prescription letters the prescribing of corticosteroid slightly increase). Corticosteroids are employed for symptomatic treatments and cause undesirable side effects. Therefore, benefits and disadvantages of their long-term prescription should be considered (16). Since the use of corticosteroids was inelastic to price in Iran, increases the price of this medicine as a controlling policy to reduce the consumption of corticosteroids could not be successful.

According to the results, the average cost of prescription letters was very elastic to the average number of medicines in per prescription letters and 10% increase in the average number of items that prescribed in each letter will lead to 18% increase in the average cost of prescriptions. Based on the logarithmic equation results, indiscriminate increase in prescribing of medicine has the greatest impact on increasing medicine expenditures. This suggests adverse effects of the irregular and wide use of medicines and a large number of medicine in each prescription letters and thereby negative economic burden and side effects on the patient. By increasing consumption of medicines the risk of side effects will increase. So, it is estimated that the incidence of death due to the side effects of medicines is one person in the thousands of deaths in the hospital (31). It must be note that many factors other than clinical considerations can affect physician decision on prescribing of medicines. Besides the individual

characteristics of physician, patient characteristics such as age, socioeconomic status, and illness have significant effects on prescription behavior (25,32,33).

So, the results of the study could be a warning signal for policy-makers in Iran to pay more attention to the use of medicines, prescription patterns and its adverse effects. This subject necessarily needs much more comprehensive studies and assessing some more factors that affected the irrational use of the drug in Iran.

Inappropriate prescriptions for medicines can reduce the quality of medical care, patient safety, and leads to a waste of resources (34, 35). This reports and probably new supplementary evidence is needed to persuade policy-makers to promote rational drug prescription. Our results revealed that the average number of medicines in each prescription letter and the prescription of antibiotics and corticosteroid medicines in Iran is markedly higher than the WHO standards and also there are considerable differences in prescription patterns according to the different geographical regions. In resolving this dilemma in Irrational use of medicines in Iran we propose that establishment of Electronic Health Records system in order to monitor and review the prescriptions and identifying errors in prescriptions and side effects of medicine could be useful. However, considering the results of the study on prescription items and according to adverse effects of indiscriminate use of medicines, make reforms in educational programs of medical students, re-training courses for physicians, and inform all people about adverse effects of the irrational use of medicines is necessary.

In addition, considering the results of the study, establishing price policies could not be successful in controlling the irrational use of the drug, restrictions in prescribing some types of medicines, publishing updated pharmaceutical standard guidelines, comprehensive therapeutic and educational protocol in order to rational prescriptions seems to be reasonable.

Acknowledgments

Hereby we express our gratitude to the Ministry of Health and Medical Education (MOHME) for providing the data used in this study.

References

1. Pharmaceutical products. WHO. (Accessed March 2017, 29, at [http://www.who.int/topics/pharmaceutical_products/en./](http://www.who.int/topics/pharmaceutical_products/en/))
2. Dumoulin JE, Kaddar MI: Guide to drug financing

The dilemma of irrational antibiotic and corticosteroid prescription

- mechanisms. (Accessed March 2017, 29, at <http://apps.who.int/medicinedocs/en/d/Jh2928e/>)
3. Pharmaceutical Sector Inquiry _ Preliminary Reports. (Accessed March 2017, 18, at http://ec.europa.eu/competition/sectors/pharmaceuticals/inquiry/fact_sheet_1.pdf.)
 4. World bank pharmaceuticals, Govindaraj R, Michel R. Reichand and Jillian C. Cohen, September 2000. (Accessed March 2017, 18, at https://scholar.google.com/citations?view_op=view_citation&hl=en&user=V6sGrijakqYC&citation_for_view=V6sGrijakqYC:Zph67rFs4hoC.)
 5. EbadifardAzar F, Rezapoor A, Rahbar A, Shokouh H, Morteza S. Estimation of the Function of Medicine Demand in Islamic Republic of Iran. *J Mil Med* 2013;15:163-8 .
 6. Khaksari M, Ahmadi Kohanali J, Sepehri G, Shafei K, Sadeghi S. Analysis of the Prescription of Physicians in Rafsanjan, 1993-1998. *J Rafsanjan Univ Med Sci Health Serv* 2002;1:1-7 .
 7. cheraghali AM, Impacts of international sanctions on Iranian pharmaceutical market. *DARU Journal of Pharmaceutical Sciences* 2013, 21:64.
 8. Mohammadi D. US-led economic sanctions strangle Iran's drug supply. *Lancet* 2013;381:279.
 9. ISPOR Mongolia Chapter. Estimating economic loss resulted from irrational use of medicine. (Accessed March 2017, 18, at http://www.ispor.org/regional_chapters/Mongolia/documents/Estimating-economic-loss%20-from-irrational-use-of-medicines.pdf.)
 10. WHO. The Pursuit of Responsible Use of Medicines: Sharing and Learning from Country Experiences 2012. (Accessed March 2017, 18, at http://www.who.int/medicines/publications/responsible_use/en/.)
 11. Liss RH, Batchelor FR. Economic evaluations of antibiotic use and resistance—a perspective: report of Task Force 6. *Rev Infect Dis* 1987;9:S297-312.
 12. World Health Organization. Control of antibiotic-resistant bacteria: memorandum from a WHO meeting, WHO Scientific Working Group on Antimicrobial Resistance. *Am J Hosp Phar* 1984;41:1329-37.
 13. Kunin CM. Resistance to antimicrobial drugs—a worldwide calamity. *Ann Intern Med* 1993;118:557-61.
 14. Loeffler JM, Garbino J, Lew D, Harbarth S, Rohner P. Antibiotic consumption, bacterial resistance and their correlation in a Swiss university hospital and its adult intensive care units. *Scand J Infect Dis* 2003;35:843-50.
 15. Abolhalaj M, Bastani P, Ramezani M, Tamizkar N. Production and consumption financial Process of drugs in Iranian healthcare market. *Dev Count Stud* 2013;3:187-91 .
 16. Mosleh A, Darbooy S, Khoshnevis Ansari S, Mohammadi M. Drug prescription based on WHO indicators: Tehran university of medical sciences facilities with pharmacy. *Tehran Univ Med J* 2008;65:12-5 .
 17. Hashemi Sh, Nasrollah A, Rajabi M. Irrational antibiotic prescribing: a local issue or global concern? *EXCLI J* 2013;12:384-95.
 18. Andayesh Y, Keshavarz K, Zahiri M, Mirian I, Beheshti A, Imani A, et al. The Effects of Drug Subsidies Exclusion on Price Index of Sectors and Household's Expenditures; Using Structural Path Analysis. *J Health Adm* 2011;13:45-56.
 19. Aminlo H. Fifty-six percent of public health expenditures are financed by people. (Accessed March 2017, 18, at www.salamatnews.com/ViewNews.aspx?ID=50617.)
 20. Dinarvand R, Nikzad A. Status of prescription and drug usage in Tehran in 1998. *Hakim* 2000;1:1-7 .
 21. Sadeghian GH, Safaeian L, Mahdanian AR, Salami S, Kebriaee-Zadeha J. Prescribing Quality in Medical Specialists in Isfahan, Iran. *Iran J Pharm Res* 2013;12:235-41.
 22. Goldman DP, Joyce GF, Lawless G, Crown WH, Willey V. Benefit design and specialty drug use. *Health Aff* 2006;25:1319-31 .
 23. How to investigate drug use in health facilities. World Health Organization: Geneva: 1993.
 24. Raveh D, Levy Y, Rudensky B, Yinnon, AM. Longitudinal surveillance of antibiotic use in the hospital. *Q J Med* 2001;94:141-51.
 25. Beringer PM, Wong-Beringer A, Rho JP. Economic aspects of antibacterial adverse effects. *Pharmacoeconomics* 1998;13:35-49.
 26. Meymand M, Sepehri G, Farokhi N, Beygim M, Motevali Zadeh H. Pattern of drug use among residents of Bam during the first 6 months after the 2003 earthquake. *Hakim Res J* 2008;10:27-33 .
 27. Kozyrskij AL, Dahl ME, Chateau DG, Mazowita GB, Klassen TP, Law BJ. Evidence-based prescribing of antibiotics for children: role of socioeconomic status and physician characteristics. *CMAJ* 2004;171:139-45.
 28. Stefanou A, Marshall N, Holdan W, Siddiqui A. A randomized study comparing corticosteroid injection to corticosteroid iontophoresis for lateral epicondylitis. *J Hand Surg Am* 2012;37:104-9 .
 29. Ravangard R, Jafari A, Motlagh SN. Drug Demand Function for Iranian Urban Households Based on Households' Budget. *Health Scope* 2014;3:18494 .
 30. Choi K-H, Park S-M, Lee J-H, Kwon S. Factors Affecting the Prescribing Patterns of Antibiotics and Injections.

- 2012 The Korean Academy of Medical Sciences. J Korean Med Sci 2012;27:120-7 .
31. Cholle D, Liu S. Income Elasticity of the Demand for Health Insurance and Health Care Services: A Critical Review of the Literature Final Report. Washington: Mathematical Research Inc, 2006:33-60.
 32. Shea Dennis G, Terza Joseph V, Stuart Bruce C, Briesacher Becky. Estimating the Effects of Prescription Drug Coverage for Medicare Beneficiaries. Health Serv Res 2007;42:933-49 .
 33. Cadieux GTR, Dauphinee D, Libman M: Predictors of inappropriate antibiotic prescribing among primary care physicians. CMAJ 2007;177:877-83.
 34. Meskarpour-Amiri M, Dopeykar N, Mehdizadeh P, Ayoubian A, Motaghd Z. A Study on the Factors Affecting the Prescription of Injection Medicines in Iran: A Policy Making Approach. Glob J Health Sci. 2015;7(3):291-297.
 35. Arjmand B, Goodarzi P, Mohamadi-Jahani F, Falahzadeh K, Larijani B. Personalized Regenerative Medicine. Acta Med Iran. 2017 Mar;55(3):144-149.