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Equality in pharmacies distribution: Case of Iran

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ABSTRACT

Equity in access to health service is one of the most important targets of policy makers in most countries. Access to health resources in the community lead to greater accessibility to them, so it has been as one of economic consideration in allocation resources. This paper is a retrospective and cross-sectional study which examined the distribution of pharmacies as a one of the most important health resource in Shiraz during 2006-2011. The census and estimated data on the distribution of population were obtained from the Statistical Center of Iran and the data on the number of total pharmacies were obtained from Food and Drug Administration. We plotted the Lorenz curve and calculate the Gini index using Excel 2007. Also, stata 11 was used for regression analysis. According to result The Gini index for the distribution of pharmacies during considered years was closed to 0.25. Gini index for public pharmacies was 0.449in 2006 while it was 0.503 in 2011. For private pharmacies the Gini index was 0.225 in 2006 and 0.224 in 2011. The Gini index for distribution of pharmacies in total was 0.257 and 0.250 in 2006 and 2011 respectively. Therefore distribution of pharmacies in Shiraz have not been equitable in general, then some interventions like reallocation of the pharmacies can help to achieving to better access to this resource.

Keywords: equality, Lorenz curve, Gini index, pharmacy, Shiraz.

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INTRODUCTION

We have seen growth in the ground of equity in recent years. Mostly policy making, researchers and investigators employ this concept. Health inequities come up from differences in access to health between different individuals and groups. While health inequity is owing to lack of attention to fairness in disparities. Researchers and policy makers can make and use their own definition of equity according to different views expressed[1].Health equity means dipping health disparities by improving the health of the economically deprived, not by a worsening of the health of privileged people. Although the mounting poverty is one of the communities' concerns, but a different central issue that has anxious politician and planner is inequalities in wealth and the special effects that this issue affect their health and follow-on in making them more poor [2, 3]. Pursue the objective of equity in health with the notion of reducing health inequalities through improving health has social and economic profit. It does not mean to destroy the position of those benefiting from the economic and social advantages. Progress in achieving equity in health considering how health inequities change over time, is visible [4]. If we focus on equity, we become sure that people in society according to their needs not according to other criteria such as ability to pay health care, have access to the least standards. This interpretation is identified in terms of equal access for equal need, while access refers to financial and geographical barriers or to the severity of the disease[5]. Equity health measuring sector has concepts like: health level, distribution of health care resources, costs, use and access. Equity definition is appealing fundamentally and intuitively when defined as equality of health, however, accurate measurement of health and health care resource distribution is a problem for equalization of the levels [6].it is also possible in some cases to achieve this definition sometimes with efficiency and sometimes with inefficiency. Sometimes achieving equity in society can cost a lot, but leads to a rapid recovery of the patient and ultimately achieving equal health levels in the community[7]. Health equity points to minimum unavoidable disparities in health and its determinants among people of different social levels. When there is avoidable differences and unfairness in health and its determinants, society will be observer of inequity. But not all health inequalities will be included in different parts of inequity. In particular, inequalities in health are associated to differences in groups which is due to differences in income, wealth, occupation, geographic location, gender and race[8]. The pharmacy market allows to patient to obtained prescriptions drugs locally and also looking for other services provided by pharmacy.Available pharmacies in community may be influence by market factors such as population characteristics, payers, health

care system and competitive factors[9]. Community pharmacies are the most available and easy to get to health resources to the general population, particularly in remote areas. Because of great quantity, wide geographical distribution and extensive hours of function of community pharmacies, pharmacists running in this health care location are in the greatest situation to observe the sound effects of pharmacotherapy to avoid adverse drugs reactions and to match up drug therapy prescribed by numerous health care providers. Pharmacies are major service centers in the city that quick and prompt access to them is of utmost in reducing the burden of disease and achieving social equity. Considering the importance of appropriate access to pharmacy this study was attempted to investigate the distribution of pharmacies in Shiraz Province during 2006-2011.

MATERIAL AND METHOD

This is a descriptive-analytical and cross-sectional study. The data on population and pharmacies was gathering from Shiraz Municipality Planning and Shiraz University of Medical Sciences' Food and drug Administration during 2006-2011, respectively. We divided pharmacies into daily, boarding and also private, public, hostel. We divided Pharmacies into three categories. The first category consists of two sub-category public and private. The public pharmacies were included state and charity pharmacies. The second category includes daily and boarding pharmacies. The third category was include all pharmacies, namely, total pharmacies. The Gini coefficient was calculated for all sub-categories. The demographic data were arranged in ascending order and the population share of each region was calculated from total population and the cumulative percentage of these variables was determined. These procedures were also performed for the prior variable in the pharmacy, in a way that the number of pharmacies in each city was identified and the cumulative percentage was calculated. For analyzing equity indicators, the Gini coefficient and Lorenz curve, used Excel 2007 and stata11software and the trend of Gini index analyzing with stata 11 software. The indicators are defined and explained below.

Inequality indicators

Several indices has used for measuring inequity but in this part, we shall introduce the inequality indicators that were used in analyzing this paper. Economists used Gini coefficient and the Lorenz curve for only income distribution, at first. But later they generalized the economic indicators for the distribution of other variables such as health resources[10].

Lorenz curve

The Lorenz curve is a graphical expression about the proportional distribution among a set of resources. These resources can include people, activities, executives, officials and so on. Economists and sociologists plot Lorenz curve and calculate the Gini coefficient based on income of a city or country The Lorenz curve contrasts the distribution of a particular variable with the uniform distribution that represents equality. This equality distribution is symbolized by a diagonal line, and the greater the variation of the Lorenz curves from this line, the greater the inequality. If each person in assessment with other has a comparable income, this curve is placed on the line of equality. When incomes are not equivalent, the poor has less than the income of the rich which in Lorenz curve case it would below the equal[11, 12].

Gini index

Gini index is the most widely used measure of inequality in the distribution of resources. The Gini coefficient was stated by the Italian statistician Corrado Gini as a measure of income inequality, though it can be used to measure, say, the distribution of health or of health care resource using up. It is a number between 0 and 1, where 0 matches to perfect equality (everybody has the equal income, health care, etc.)[13,14] and 1 is perfect inequality (a person has all the income, health care, etc.). The greater Lorenz curve distance from 45 degrees line is, the more inequality or the Gini coefficient would be which this inequality equals the ratio of enclosed area between the Lorenz curve divided by the area under the line of equality and equity[15]. While the Gini coefficient is frequently used to measure income inequality, it can be used to measure wealth inequality as well[12,13] There are several methods for calculating the Gini coefficient. We used the following formula to calculate the Gini coefficient.

$$\text{Gini} = 1 - \sum_{i=1}^{n} (x_{i+1} + x_i)(y_{i+1} + y_i)$$

Y: Cumulative percentage of the health variable (number of pharmacies) in thei-thregion

X: cumulative percentage of population in i-th region

N: total number of the regions

Time trend of inequality

The time trend in inequality of pharmacies was examined by estimating regression models. One regression for each type of pharmacies was estimated, 5 regression models in total. The dependent variable was the Gini Coefficient for the pharmacy and the independent variable was the year as follows[17]:

$G = \alpha i + \beta t + \varepsilon i$

Where:

G: Gini Coefficient for each pharmacy;

t: years of study period.

We used the robust standard error for possible heteroscedasticity over time inferences. The β coefficient captures the direction and magnitude of the trend in the Gini Coefficient for each type of pharmacy. Negative β shows the Gini Coefficient declined over time and the distribution of health variable became more equal and vice versa. A P_value less than 0.05 was considered statistically significant.

RESULTS AND DISCUSSION

Shiraz is one of the major cities in Iran andit is consists of nine regions. The total number of pharmacies in Shiraz during 2006, 2007, 2008, 2009, 2010, 2011, has been 206, 215, 231, 236, 652, and 302 respectively.Table1 shows the number of pharmacies per 10000 people in Shirazduring 2006 to 2011.

Table1. The number of pharmacies per 10000 people in Shiraz 2006-2011.

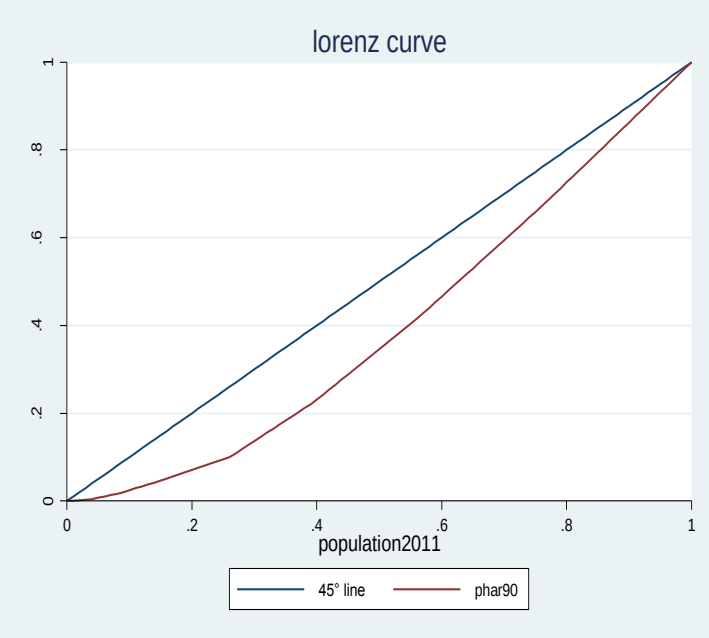
	2006	2007	2008	2009	2010	2011
Public	0.47	0.39	0.41	0.40	0.41	0.41
Private	1.54	1.18	1.19	1.21	1.32	1.37
Daily	2.01	1.56	1.60	1.61	1.73	1.77
boarding	0.29	0.26	0.26	0.26	0.25	0.11
Total	1.72	1.31	1.34	1.35	1.47	1.53

The daily pharmacy had the highest number in the studied period. For example, the number of daily pharmacy for every 10000 persons was 1.7in 2011, which is more than any other type of pharmacy. We plotted the Lorenz curve for total pharmacies which was closed to equal distribution line (figure 1). As shown in Table 2, Gini index for public pharmacies was 0.449in 2006 while it was 0.503 in 2011. For private pharmacies the Gini index was 0.225 in 2006 and 0.224 in 2011. The Gini index for distribution of pharmacies in total was 0.257 and 0.250 in 2006 and 2011 respectively. During these times, most pharmacies have been related to region 1 and the lowest to region 8. Also most pharmacies have been related to the private sector and the least has been related to charitable sector over these years. Most pharmacies worked on a daily basis than their nocturnal activity which in one region the number of hostel pharmacies was higher than in other areas. Distribution of pharmacies in Shiraz has not been quite equal per population, they had some differences. But overall Gini coefficient of pharmacies in the city was closed to 0.25.The figure 1 shows the Lorenz curve in distribution of total pharmacies in Shiraz

in 2011. Also, the figure 2 shows the Gini coefficient trend in distribution of pharmacies during 2006 to 2011.

Table 2: Gini Coefficient for the different types of pharmacies (2006-2011).

Category	subcategory	2006	2007	2008	2009	2010	2011
1	public	0.449	0.404	0.401	0.413	0.413	0.503
	Private	0.225	0.258	0.254	0.249	0.216	0.224
2	daily	0.233	0.248	0.254	0.249	0.209	0.224
	boarding	0.334	0.386	0.347	0.356	0.364	0.338
3	total	0.257	0.282	0.278	0.276	0.245	0.250



Fiqure1- Lorenz curve for the distribution of pharmacies in Shiraz in 2011

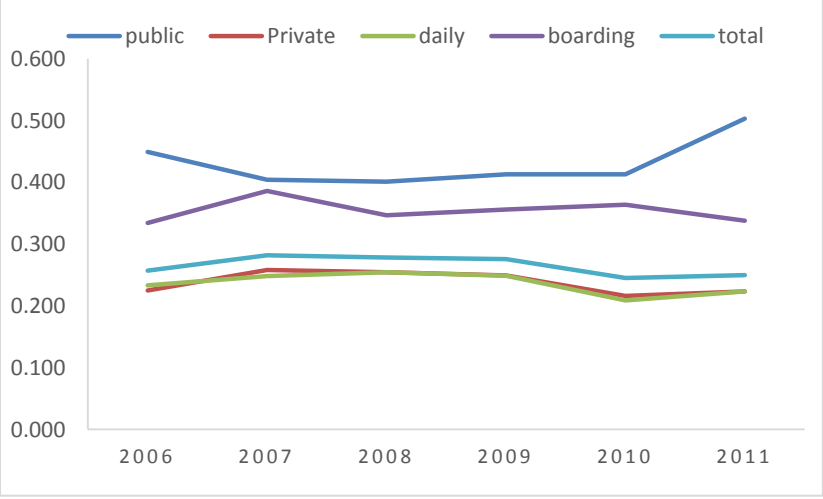


Figure2- The trend of Gini coefficient of pharmacies distribution in Shiraz 2006-2011.

The results of time trend in inequality of pharmacies is presented in table 2. As the table shows, β-Coefficient for all of pharmacies, except public pharmacies was negative, but none of them weren't statistically significant. Theβ-Coefficient for public, private, daily, boarding and total pharmacies was 0.008, -0.003, -0.0047, -0.001 and -0.004, respectively.

Table 3: Time trend of inequality in the distribution of pharmacies in Shiraz province

Pharmacy Type	β-Coefficient	Robust S. E.	P-Value
Public	0.008	0.011	0.5
Private	-0.003	0.004	0.44
Daily	-0.0047	0.003	0.24
Boarding	-0.001	0.0057	0.86
Total	-0.004	0.0037	0.327

Accessibility of health resources is vital in defining equity and efficiency level of a healthcare system. We can reduce the number of patient and illness with attention to equity issues. We had a healthy communication, if persons received health care needs in accurate time and place. Investigating the degree of inequality in pharmacy distribution by population with census data was the main objective of this article. We plotted the Lorenz curves and calculated Gini coefficient, using stata 11 and Excel 2007 software. According to results a complete equality in the distribution of pharmacies is not fully respected but somehow it is. However, the results by no means show a sufficient number of pharmacies in Shiraz. According to calculations, there are greater inequity in public pharmacies than any other pharmacies, and the distribution of private pharmacies, has gone to fair recently. According to equity issues, whatever we add to population, there should be an increase in the number of pharmacies. So it can be inferred that the distribution of pharmacies in areas 8, 9, 5 went well, but there was reduction and irregularities in the number of pharmacies in the area 6 and 7. The highest number of pharmacies belong to region1 and distribution in this region was due to disregard for the population and more pharmacies are unfairly compared to other areas. Also region 2 and 4 suffer from a lack of equality in distribution due to the negligence of the population and reduction in the distribution of pharmacies. Totally, the inequality in distribution of pharmacies had a negative trend during the study period and Gini coefficient have been decreased. It means with passing the time the inequality in distribution of the pharmacies have been decreased. But this decrease in inequality was not statistically significant. It should note the distribution of public pharmacies get worse during this time. According to a study conducted in Nigeria about "Distribution of health care facilities in Osun Public", the results showed that there are inequality and a major gap in access

to health care facilities in the public areas and this study showed that there is an immediate need for intervention by the government to reduce inequalities in the distribution of health care facilities and upgrade these facilities[18]. The research entitled "Regional Disparities in determining healthy sweeteners" in China declared that regional health inequalities has been increased with increasing economic growth rate in China. .Regional disparities in the health not only increases with wealth distribution, but also is related to the distribution of health resources and basic health services[19]. Another study which conducted by Kiadaliri et al, investigated the geographical distribution of access to health care in rural areas of Iran. The Results showed that there were significant differences in access to Health house[20].Also, Lin studied the inequality in distribution of pharmacies in rural and urban areas in Illinois, America and results were indicated unfair distribution of pharmacies in rural areas[9]. There is a big difference in access to health services and using them, like pharmacy, because in different walks of life the issues of quality, effectiveness and efficiency of services are not a base for providing them. But the government, regardless of income, location, ethnicity and other factors and considering disease level, or death and all in all in terms of the need, create an equitable distribution of access to care among different groups. Despite the charges in these contexts, it could prevent large amounts of cost like child mortality in a poor area. Access to pharmacies is important because occasionally it is vital for patients to receive timely treatment, especially in rural and deprived areas. Thus, the lack of drug delivery, bring an irreparable harm to the patient and his/her family and also wider to the healthcare system. Access to the pharmacies can reduce the incidence and prevalence of disease, burden of disease in the community, transport costs and therefore the cost to the individuals and cost of lost time, social and psychological which are among the hidden components of costs to the patient and his/her family. The reasons can be cited for inequality in the distribution of pharmacies is population and number of households in different regions. If the pace of economic growth is not associated with stability, it could be a factor that increases the number of pharmacies in different areas because causes inequitable income distribution. Some actions of the Ministry of Health like approving regulations that violates some pharmacies' fraud will cause economic turmoil in private pharmacies. This makes the responsible pharmacist colleagues not to run their pharmacies. We could also point to the difficulties that Department of Finance and Taxation have caused for private pharmacies and now with heavy taxes, have provided bankrupt in pharmacies. Due to the characteristics of the economic - social - demographic areas and also High population density and uneven distribution, are the reasons for the unequal distribution of health care resources of such pharmacies in some areas. There is not a

scientific model for giving priority, healthcare, determining and giving assurance to the public for access but according to the concentration of population in major cities, especially in areas where the price of living has emerged; there is an increasing need to services, especially easy access to health-care services. Increasing the number of centers does not solve the problem, but actually fair and equal distribution leading to timely and easy access and is of the policy objectives which reduce the minimum cost to provide welfare of the people of the region. According to the study conducted in Shiraz, it is recommended to subtract a number of pharmacies and only add pharmacy to areas facing shortage or it could just be added to the number of pharmacies in the area of pharmacy as far as no pharmacy is added to restrict 1 pharmacy. Given the importance of access to health resources to all community, it is recommended in this context further studies should be done keeping in mind the needs of the community.

CONCLUSION

There was unidentified trend in the inequality of distribution of pharmacies in Shiraz between 2006 and 2011 but according to results distribution of pharmacies were equitable in general. Some interventions such as reallocation of resources in base of population's need could be helpful factor for achieving equity in health sector and improving the society health in Shiraz.

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