Araştırma / Research Article

Relationships between pharmaceutical expenditures and life expectancy: Assessment for Turkey and OECD countries

İlaç harcamaları ve yaşam beklentisi arasındaki ilişkiler: Türkiye ve OECD ülkeleri için bir değerlendirme

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ÖZET

Giriş ve amaç: Bir ülkenin sağlık durumunun ölçülmesinde çeşitli değişkenler göz önünde bulundurulmaktadır. Bu göstergelerin başında sağlık harcamaları gelmektedir. Sağlık harcamaları içerisinde ilaç harcamaları oransal olarak büyük bir yer kaplamaktadır. AB ve OECD ülkelerine bakıldığında bu oran yüzde yirmi civarındayken, gelişmekte olan ülkelerde yüzde otuzlar civarındadır. Bu nedenle ilaç harcamaları önemli bir göstergedir. Diğer taraftan en temel sağlık göstergelerinden bir tanesi doğumda beklenen yaşam süresi göstergesidir. Bu gösterge aynı zamanda ülkenin gelişmişlik düzeyi ile ilgili ipuçları da vermektedir. Bu bağlamda bu çalışmanın amacı OECD ülkelerinde GSMH içerisinde ilaç harcamalarının payı ve kişi başı ilaç harcamaları (dolar) değişkenleri ile doğumda beklenen yaşam süresi değişkeni arasındaki ilişkilerin incelenmesidir. **Gereç ve yöntem**: Araştırmada ikincil veriler kullanılmış, veriler temel olarak OECD veri tabanından elde edilmiştir. Veri analizinde SPSS 21.0 paket programı kullanılmıştır. Veriler korelasyon analizine tabi tutulmuştur. **Bulgular**: Gerçekleştirilen korelasyon analizi neticesinde GSMH içerisinde ilaç harcamalarının payı ile doğumda beklenen yaşam süresi arasında istatistiksel olarak anlamlı bir ilişki bulunamamıştır (p>0.05). Kişi başı ilaç harcamaları ile doğumda beklenen yaşam süresi arasında istatistiksel olarak anlamlı, pozitif yönlü ve orta kuvvette bir ilişki olduğu tespit edilmiştir (p<0.05). **Sonuç**: Bu sonuçlar ilaçların doğru ve yerinde kullanımıyla beraber kişi başı ilaç harcamalarının artmasının doğumda beklenen yaşam sürelerine pozitif yönde etki edeceğini göstermektedir. Bu nedenle Türkiye açısından kişi başı ilaç harcamalarında OECD ortalamasının yakalanması gerektiği önerilmektedir.

ABSTRACT

Introduction and objective: Many variables are taken into account in measuring the health status of a country. Health expenditures are the leading indicators. In health expenditures, pharmaceutical expenditures have a large proportion. Looking at the EU and OECD countries, this rate is around twenty percent, while it is around 30 percent in developing countries. Therefore, pharmaceutical expenditure is an important indicator. On the other hand, one of the most basic health indicators is the life expectancy at birth. This indicator also provides clues about the level of development of the country. In this context, the aim of this study is to investigate the relationship between the share of pharmaceutical expenditures in GDP, pharmaceutical expenditure per capita (dollars) and life expectancy at birth in OECD countries. **Materials and methods**: Secondary data have been used in the study and the data have been obtained from the OECD database. The data have been analyzed in SPSS Version 21.0 statistical package program. Correlation analysis has been used. **Results**: As a result of the correlation analysis, no statistically significant correlation has been found between the share of pharmaceutical expenditures in GDP and the life expectancy at birth (p> 0.05). There is a statistically significant, positive and moderate relationship between pharmaceutical expenditures and life expectancy at birth (p <0.05). **Conclusion**: These results indicate that the increase in pharmaceutical expenditures per capita with correct and appropriate use of drugs have a positive effect on the life expectancy at birth. Therefore, reaching the average per capita pharmaceutical expenditures in OECD countries is recommended for Turkey.

GİRİŞ

Health services are distinguished from other goods and services sectors due to their unique characteristics. One of the reasons which makes health services different and distinguished is being related to human health. Therefore, it is a very sensitive area. Health services have a number of characteristics such as being a non-delayable service in most cases, requiring a different approach each time, needing human resources working together from many different areas and determining the demand from the supply side (1-3). Besides, the tolerance of errors in health services is low and even small mistakes can cause great damages both financially and morally. Moreover, these damages affect not only the patients receiving service but also the service providers in terms

of malpractice and may cause serious damages to health institutions (4,5). With having these characteristics, health services, which are in a special position, are of great importance not only for individuals but also for society. Accordingly, health services play an important role in making individuals feel healthy and happy, they also contribute to raising the health level of the society. Thus, it makes a great contribution to the formation of a healthy society and healthy manpower. Thanks to these contributions, factors such as increasing in production, creation of prosperity and supporting economic growth, which are extremely important for a country, are also developing (6,7). At this point, there are a number of criteria used to measure the outcomes of health services. Some of these criteria are macro health measures and assess some health outcomes on country/region basis. The life expectancy criterion is the most important one. One of the most basic and simple measures in measuring health services in a country is life expectancy at birth or at certain ages. In addition, there are criteria used to measure the outcomes and quality of services of health institutions in a micro scale. Other macro criteria are birth and death measures and morbidity and mortality measures calculated on country/region basis. With these criteria, it is possible to collect data about the health level of a country or region and evaluate the data and take steps to improve health services (8). On the other hand, there are some other indicators that are thought to be related to health indicators. These are basically the resources allocated to health services and the criteria indicating the current situation in health services. These are indicators such as health expenditures, pharmaceutical expenditures, number of physicians and nurses, the number of hospital beds, the number of medical devices etc. These can be analyzed by the change they have shown from past to present (called time series), or by comparing them with the developments in other countries.

Pharmaceutical expenditures in OECD countries reached 800 billion dollars in 2013, indicating that 20% of the total health expenditure is pharmaceutical expenditures. OECD countries' mean pharmaceutical expenditures accounted for 1.4% of GDP in 2013. Per capita pharmaceutical expenditure is 515 dollars as OECD average for the same year. Pharmaceutical expenditures are expected to increase by 50% in the near future with the introduction of high-cost and specialty medicines into the pharmaceutical markets (9). However, it is stated that technologies increasing health expenditures lead to threat many diseases which cannot be threated before and prolong life span. New technology medicines reduce healthcare costs not only with treating untreated diseases, but also with reducing other health expenditures such as hospital stay (10).

As pharmaceutical expenditures make up almost 20% of health expenditures in EU member states, many countries are working on increasing the efficiency of pharmaceutical expenditures. In this context, appropriateness of prescriptions, excessive/unnecessary or inadequate use of medicines are examined (11).

Life expectancy at birth in OECD countries has been increasing over the years (3-4 months each year) and in 2013 the OECD average was 80.5 years. Japan, Spain and Switzerland are leading in this field with more than 82 years. In OECD countries, although women have life expectancy at birth 5 years more than men, this gap is has been closing. The groups with higher education have more 6 years life expectancy at birth (9).

Improvements in life expectancy are important not only for the welfare of societies, but also for the economic development and welfare of nations, because an increase in longevity is recognized as an important driving factor behind economic growth and development. There is a consensus in the literature that healthy individuals are one of the most important factors of economic growth. Technological change also contributes positively to this process. Life expectancy has increased globally in the last fifty years. In OECD countries, life expectancy increased from 67.9 in 1960 to 80 in 2010 meaning increased by 18%. There are numerous factors behind this increase, such as improvement in socioeconomic indicators, risk factors and health technology. The debate about the factors affecting the increase in life expectancy has not yet reached a conclusion. Some health economists argue that the contribution of medical care to increases in longevity and other health status improvements is relatively low, and that other factors such as socioeconomic development, lifestyle, and environment are the most important factors (12). On the other hand, there are studies indicating that there is a connection between health expenditures and life expectancy at birth (13). Similarly, in some studies, it has been found that pharmaceutical expenditures and new medicines increase life expectancy at birth (14,15).

In this context, the relationship between per capita pharmaceutical expenditures and life expectancy at birth has been examined and some evaluations have been made for OECD countries in this study.

MATERIALS AND METHODS

The aim of this study is to investigate the relationship between per capita pharmaceutical expenditure and life expectancy at birth in OECD countries.

The data used in the study is secondary data obtained from OECD dataset and consists of per capita pharmaceutical expenditure, ratio of pharmaceutical expenditures in GDP and life expectancy at birth. 33 countries have been

examined in total (16). The most up-to-date data for per capita pharmaceutical expenditure variable is from 2016. Because there is not any current data on OECD database about pharmaceutical expenditures for Turkey, the data (170 dollars) has been obtained from Turkey Pharmacists Association (TPA) (17). The data on the proportion of pharmaceutical expenditures in the GDP and life expectancy at birth have been obtained from the OECD database and the data for 2016 have also been analyzed here. The data has been transferred to MS Excel and then to the SPSS 20.0 package program in order to examine the relationships between variables. Ethics committee approval was not required because the data of the study is available at publicly accessible databases and no human participants have been included in the study.

The main question of the research is: "Is there a relationship between per capita pharmaceutical expenditures and life expectancy at birth?"

FINDINGS

The data obtained from the research are summarized in the table 1.

Table 1. Research data

COUNTRIES	Pharmaceutical Expenditures in GDP (%)	Per capita pharmaceutical expenditure (Dollars)	Life Expectancy at Birth (Year)
Turkey	0.83	170	78
Luxembourg	0.53	554	82.8
Denmark	0.68	335	80.9
Netherlands	0.77	410	81.6
Norway	0.79	485	82.5
Israel	0.92	315	82.5
Ireland	0.95	676	81.8
Iceland	0.96	488	82.3
Sweden	1.07	524	82.4
UK	1.11	476	81.2
Finland	1.19	516	81.5
Mexico	1.24	232	75.4
Czech Republic	1.25	433	79.1
Austria	1.25	631	81.7
Poland	1.35	369	78
Australia	1.35	640	82.5
Portugal	1.37	419	81.2
Belgium	1.47	684	81.5
Slovenia	1.55	507	81.3
Italy	1.58	628	83.3
Germany	1.59	777	81.1
France	1.60	663	82.4
Switzerland	1.69	1080	83.7
Korea	1.71	653	82.4
Spain	1.71	621	83.4
Latvia	1.77	452	74.7
Lithuania	1.81	541	74.8
Canada	1.86	860	81.9
Slovakia	1.86	566	77.3
USA	2.10	1208	78.6
Hungary	2.12	566	76.2
Japan	2.15	874	84.1
Greece	2.22	595	81.5

Source: https://data.oecd.org/; TPA, 2017

The country with the lowest proportion of pharmaceutical expenditure in the GDP is Luxembourg with 0.53% and the highest is Greece with the highest rate of 2.22%. The rate is 0.83% in Turkey. The lowest per capita pharmaceutical expenditure is in Turkey with 170 dollars. The highest value is in USA with 1,208 dollars. The country with the lowest life expectancy at birth is Latvia with 74.7, and Japan with the highest is 84.1. Descriptive statistics of the data are as follows (Table 2);

Table 2. Descriptive statistics of the data

Variables	Min	Max	Mean	SD
Pharmaceutical Expenditures in GDP	,53	2,22	1,4061	,457
Life Expectancy at Birth	74,70	84,10	80,7152	2,620
Per capita pharmaceutical expenditure (Dollars)	170,00	1208,00	574,1818	215,77

Mean of pharmaceutical expenditures in GDP is 1.40% ± 0.45%, mean of life expectancy at birth is 80.7 ± 2.62 and mean of per capita pharmaceutical expenditures is 574.18 ± 215.77 (dollars) in OECD countries. Turkey is below the OECD mean in terms of pharmaceutical expenditures in GDP, per capita pharmaceutical expenditures and life expectancy at birth.

According to the ranking announced by OECD (2015), Turkey ranks 29th in terms of life expectancy at birth for males and 32th for females. In terms of life expectancy at the age of 65, it ranks 32nd for males and 33nd for females. It also ranks 29th in deaths due to cardiovascular diseases. This table is important for understanding the position of Turkey among OECD countries. In this context, more efforts should be made to improve life expectancy in Turkey.

After descriptive statistics, the relationships between variables have been examined. Correlation and regression analyzes have been used to investigate the relationships between the variables (regression assumptions cannot be provided because the data shows non-parametric characteristics). Before the analysis, the dependent variable has been tested for normal distribution. Kolmogorov-Smirnov analysis of the dependent variable has revealed that the data is not normally distributed (p<0.05). A non-parametric test, spearman correlation, has been conducted. The findings of the analysis has been shown in table 3;

As a result of the correlation analysis, no statistically significant relationship has been found between per capita pharmaceutical expenditures in GDP and life expectancy at birth (p> 0.05). On the other hand,

Table 3. Spearman correlation analysis

Variables	M	SD	Pharmaceutical Expenditures in GDP	Life Expectancy at Birth	Pharmaceutical expenditures per capita (Dollars)
Pharmaceutical Expenditures in GDP	1.40	.45	-		
Life Expectancy at Birth	80.71	2.62	-.130	-	
Pharmaceutical expenditures per capita (Dollars)	574.1	215.77	.587*	,414**	-

*p<0.01, **p<0.05

a statistically significant, positive and moderate relationship has been found between per capita pharmaceutical expenditures and life expectancy at birth variables (p<0.05, r = 0.414). In the study, regression assumptions cannot be provided because the distribution of life expectancy at birth data is not normal.

DISCUSSION AND CONCLUSION

Pharmaceuticals is an issue that needs to be scrutinized not only for Turkey but also for all countries in the world. Pharmaceuticals are essential in a health care system, especially in the curative aspect of health services. A number of medicines are used directly to treat diseases, some are offered as a support in the treatment process, and some are used with aesthetic concerns beyond the treatment of diseases. For example, a hair loss prevention medication is often used on a person's aesthetic concerns and can make individuals feel good both psychologically and socially. On the other hand, unnecessary and excessive use of medicines is also possible in some cases. One of the most striking examples of this subject today is the use of antibiotics. Individuals may demand antibiotics even when they are unnecessary/useless. Some other medicines, although they have different indications, can be used by individuals for their side effects such as drowsiness in order to "fall asleep easily" or any other reasons. The use of medicines can be effective in individuals' physical, psychological and social well-being. However, unnecessary, excessive or inadequate use of the medicines may threaten firstly the health of individuals and then the society. At this point, pharmaceutical expenditures can have positive effects on health if the medicines are used when they are necessary and as recommended. It is stated that there are sort of problems in efficient using of medicines in Turkey. In particular, there is a problem of excessive antibiotic use and therefore, there is a need for measures to promote rational drug use, given the possibility of drug resistance (18).

When descriptive statistics have been calculated, it has been understood that Turkey fall behind the OECD mean scores in life expectancy at birth and per capita pharmaceutical expenditures. Accordingly, Turkey

has been found to be at the last part of the ranking for life expectancy at birth and at 65 age both for women and for men. Therefore, it is apparent that more efforts should be made to improve Turkey's health indicators. On the other hand, a statistically significant, positive and moderate relationship has been found between life expectancy at birth and per capita pharmaceutical expenditures variable. In this sense, although it is thought that life expectancy at birth increases with the increase at per capita pharmaceutical expenditures, it is stated in some studies that the increase in life expectancy at birth will cause an increase in the elderly population and therefore, pharmaceutical expenditures will increase due to increasing chronic and degenerative diseases (19). Therefore, it can be stated that this relationship is two-sided. Medicines have negative effects on human health in case of uncontrolled/excessive, unnecessary or inadequate use of them along with their curative, therapeutic and life-prolonging effects. When these problems are taken into consideration, it is necessary to carry out studies both at the level of physicians and the society in order to ensure conscious pharmaceutical consumption. As a result of these studies, negative aspect of pharmaceutical expenditures should be controlled. Thus, it is possible to transfer the resources obtained by decreasing pharmaceutical expenditures to other items of health expenditures and to improve service quality (20).

In a study investigating the effects of income level and health expenditures on life expectancy and infant mortality rate, it is stated that if countries increase their per capita health expenditures by 1%, life expectancy at birth will increase by 7.2 years (13). In another study evaluating Turkey's health expenditures, it was concluded that with an increase in health expenditures, life expectancy at birth will also increase and infant mortality rate will decrease (21). In another study, it was found that per capita health expenditures has an impact on the life expectancy at the age of 65 (22). On the other hand, in some studies, it is stated that health expenditures and health status are not directly related (18,23) and that countries should determine their own optimal health expenditures (18). Frech and

Miller (2004) found that there is a relationship between pharmaceutical expenditure and life expectancy at birth. In some other studies, it has been stated that the increase in the number of cumulative medicines causes an increase in the health level of the population and life expectancy (Akt. 12). Lichtenberg et al. (2014) reported that new technological medicines prolong life expectancy in HIV cases. In the same study, it has been stated that the average age of death increased by 3.6 years in the period from 1999 to 2008 and this number would increase only by 0.6 years in the absence of medicine-related innovations (12).

CONCLUSION

There are many factors that are stated to have an impact on the life expectancy at birth. Health expenditures and per capita pharmaceutical expenditures in health expenditures are the most important of these factors. Although the increase in pharmaceutical expenditures causes some financial concerns, the contribution of new medicines to the life expectancy and quality of life reduces these concerns (24). Therefore, it can be said that the increase in pharmaceutical expenditures with the control of nonconformities in their use will have a positive effect on life expectancy at birth. Here, a number of recommendations are made to policy makers. First of all, it is necessary to increase the efforts related to proper medicine use and to prevent excessive/unnecessary or inadequate medicine use. Besides, Turkey's pharmaceutical expenditure should reach the OECD average. Alongside with these, taking care of other factors that are thought to affect life expectancy at birth will help to improve health outcomes.

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