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RESEARCH ARTICLE
KLİNİK ÇALIŞMA

Treatment cost of chest diseases during the COVID-19 pandemic: Case analysis at the Düzce University Hospital

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ABSTRACT

Treatment cost of chest diseases during the COVID-19 pandemic: Case analysis at the Düzce University Hospital

Introduction: *The aim of the study was to determine the cost of Coronavirus disease-19 (COVID-19) patients who were treated as outpatients and inpatients at Düzce University Health Application and Research Center (DUHARH) Chest Diseases Clinic before and after the pandemic from the perspective of the Social Security Institution (SSI).*

Materials and Methods: *The study included 26.438 patients who applied to the Chest Diseases clinic in DUHARH before the COVID-19 pandemic (March 10 2019-March 10 2020) and after (March 11 2020-March 11 2021) and 2.971 patients who were hospitalized in the service. A sample was not selected in the research, and the entire universe was included in the study. The data obtained retrospectively were analyzed from bottom to top and through document analysis management. Frequency and percentage calculations, Spearman Correlation analysis, and Mann-Whitney U tests were used to evaluate the data.*

Results: *Before the COVID-19 pandemic, the average unit cost in the policlinic was 46.14 TL/patient ($8.14/patient), and the average unit cost was 64.69 TL/patient ($9.23/patient) after the COVID-19 pandemic. The average cost of the pre-COVID-19 pandemic service was calculated as 1.139,64 TL/patient ($200/patient). After the COVID-19 pandemic, the average unit cost in the service was 2.136,27 TL/patient ($304.75/patient). A statistically significant difference in terms of costs was found between the two periods. It was determined that the costs of COVID-19 patients changed in terms of length of stay, age, and sex (p< 0.05).*

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Conclusion: *Even though the number of patients in the Chest Diseases clinic has decreased during the pandemic process, the costs have increased due to the high cost of COVID-19 patients and the patients needing advanced examination and treatment in this period. For this reason, patients need to apply to the relevant unit early.*

Key words: *COVID-19; chest diseases; cost of disease*

ÖZ

COVID-19 pandemi sürecinde göğüs hastalıklarının tedavi maliyeti: Düzce Üniversite Hastanesi'nde vaka analizi

Giriş: *Koronavirüs hastalığı 2019 (COVID-19) pandemi öncesi ve sonrası süreçte Düzce Üniversitesi Sağlık Uygulama ve Araştırma Merkezi (Hastanesi- DÜSUAH) Göğüs Hastalıkları Kliniği'nde ayaktan ve yatarak tedavi edilen hastaların Sosyal Güvenlik Kurumu perspektifi açısından maliyetini tespit etmektir.*

Materyal ve Metod: *Araştırma, DÜSUAH'da COVID-19 pandemi öncesi (10 Mart 2019-10 Mart 2020) ve sonrasında (11 Mart 2020-11 Mart 2021) Göğüs Hastalıkları Polikliniği'ne başvuran 26.438 hastayı ve serviste yatırılarak tedavi edilen 2.971 hastayı kapsamaktadır. Araştırmada örneklem seçilmemiş evrenin tamamı çalışmaya dahil edilmiştir. Retrospektif olarak elde edilen veriler, aşağıdan yukarı ve doküman analizi yönetimiyle analiz edilmiştir. Verilerin değerlendirilmesinde frekans ve yüzdelik hesaplamalar, Spearman Korelasyon analizi ve Mann-Whitney U testleri kullanılmıştır.*

Bulgular: *COVID-19 pandemi öncesi poliklinikte ortalama birim maliyet 46.14 TL/hasta ($ 8.14/patient) ve COVID-19 pandemi sonrasında ise ortalama birim maliyet 64.69 TL/hasta ($9.23/patient) olarak belirlenmiştir. COVID-19 pandemi öncesi serviste ortalama birim maliyet 1139.64 TL/hasta ($200/patient) olarak hesaplanmıştır. COVID-19 pandemi sonrasında ise serviste ortalama birim maliyet 2.136,27 TL/hasta ($304,75/patient) olarak bulunmuştur. Her iki dönem arasında maliyetler açısından istatistiksel olarak anlamlı fark bulunmuştur. Yatış süresi, yaş ve cinsiyet açısından da COVID-19 hastalarının maliyetlerinin değiştiği belirlenmiştir (p< 0,05).*

Sonuç: *Pandemi sürecinde Göğüs Hastalıkları Kliniği'nde hasta sayısı azalmasına karşın COVID-19 hasta maliyetlerinin yüksek olması ve bu dönemde gerçekten ileri tetkik ve tedavi gerektiren hastalar nedeniyle maliyetler artmıştır. Bu nedenle hastaların ilgili birime erken başvuru yapmaları önem arz etmektedir.*

Anahtar kelimeler: *COVID-19; göğüs hastalıkları; hastalık maliyeti*

INTRODUCTION

Coronavirus disease-19 (COVID-19) is a global pandemic caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), in which the first case was seen in Turkey on the same date as it was declared a pandemic by the World Health Organization (WHO) on March 11, 2020 (1). Chest diseases are one of the main branches at the center of differential diagnosis, treatment, and follow-up of COVID-19 cases. It is known that respiratory failure due to lung involvement in the COVID-19 pandemic increases mortality in risk groups (2).

In this study, the treatment costs of patients treated in the service and policlinic were analyzed from the perspective of Social Security Institution (SSI) considering all disease groups in the Chest Diseases clinic and the effect of COVID-19 disease on other diseases during the period before (March 10, 2019-March 10 2020) and after (March 11 2020-March 11 2021) the COVID-19 pandemic in DUHARH in Turkey. The cost elements included in the examination were medicine, medical equipment, intervention, workup, and imaging expenses. Besides, the effects of patients' age, sex, length of stay in hospital on total cost elements were investigated. In addition, the costs of chest diseases in the pre-and post-COVID-19 pandemic period were compared and discussed.

The cost of the disease, also known as the burden of the disease, is a definition that involves various aspects of the impact of disease on the health outcomes of a country, specific regions, communities, and even individuals (3). While direct costs are the opportunity cost of resources used to treat a particular disease, indirect costs are the value of resources lost due to a particular disease (4).

Disease cost analysis is an essential field of study, which is carried out from a different perspective in terms of hospitals providing health services related to any disease, reimbursement institutions that cover the financing of the service provided, Social Insurance Institution (SII), and private insurance institutions, other government institutions, employers, patients, and their relatives, as well as all segments of society (5). Since SSI covers a large part of disease costs in our country, a cost study was carried out only from the perspective of SSI in this study.

Some studies have been carried out in the literature using different perspectives on the cost of treatment

of chest diseases. Among them, Yıldırım (2014) conducted a cost study on Chronic Obstructive Pulmonary Disease (COPD), Tanrıverdi (2013) calculated the direct cost analysis of COPD patients that affect the treatment costs of hospitalized COPD exacerbations.

Kokkotou et al. (2021) calculated the cost of patients with end-of-life (EOL) lung cancer in Greece, Sari et al., (2016) the effects of smoking on the cost and length of stay in hospital in patients with lung cancer in Iran, Ihbe-Heffinger et al. (2013) the cost of medical care for lung cancer patients in a German hospital, Perin et al., (2018), the cost of hospital treatment of patients with advanced lung cancer in a developing Southeastern European country.

Göksel et al. (2010) calculated the total, and per-patient unit cost for SSI of direct medical costs for patients with lung cancer in Turkey, Çeldir Emre et al. (2014) the cost of asthma in patients hospitalized in the second-line district state hospital chest diseases service in Turkey, Çelik et al. (2004) the average annual direct medical cost of asthma.

Hacıevliyagil et al. (2006) determined that the most common diseases in terms of hospitalization costs of hospitalized patients in the chest diseases service were COPD, lung cancer, pneumonia, and asthma, respectively. In their studies, Doruk et al. (2009) calculated community-acquired pneumonia and hospital costs.

Park et al. (2010) calculated the costs of patients with lung cancer who lived at least five years after diagnosis in a tertiary university hospital in South Korea, and Gemicioğlu et al. (2010) calculated the costs of patients with lung cancer who lived at least five years after diagnosis in a tertiary university hospital in South Korea.

MATERIALS and METHODS

This study was conducted retrospectively at DUHARH. DUHARH is the only tertiary education and research hospital in its province and has 316 beds. It includes 16.797 patients who were examined in the Chest Diseases policlinic of the hospital before the pandemic (March 10 2019-March 10 2020), 9.641 patients after the pandemic (March 11 2020-March 11 2021), 1.616 patients who were hospitalized in the service before the pandemic and 1.355 after the pandemic. All of the patients aged 18 years and older who applied to the chest diseases clinic as an outpatient or inpatient were included in the scope of the study.

Costs

Vast majority of the patients receiving treatment in Turkey benefit from health services free of charge within the scope of General Health Insurance (GHI). The financing of the expenditures arising from health care services of individuals with GHI is covered by the third party, the Social Security Institution (SSI). Within this scope, expenses incurred by hospitals are reimbursed by SSI. The price regulation applied in the collection process is provided by the Communiqué on Implementation in Health (CIH). CIH prices are a detailed pricing application determined by SSI for specific services and paid to hospitals on a transaction and packages basis, provided that they are duly invoiced. These prices are calculated in Turkish Lira and terms of the average exchange rate of the Central Bank of the Republic of Turkey for 2019 of $1= 5.67 TL, the average exchange rate for 2020 of $1= 7.01 TL.

The cost data obtained in the study consists of the invoice amount, which includes direct medical costs, examination, medicine, medical equipment, intervention, workup, and imaging expense items. Following the agreement made by the Hospital with SSI, all of these transactions are invoiced according to the HIN prices over the MEDULA system. These amounts include both package prices and non-package transaction-based amounts. In the date ranges we evaluated in our study, there was no change in CIH billing prices.

The data obtained through the hospital automation system were retrospectively analyzed with document analysis and a bottom-up approach. The bottom-up approach, one of the disease cost analysis approaches, is a method used to determine the amount of each resource used to produce a service and calculate the total costs (19). This approach uses detailed activity data to estimate unit costs. More accurate results are acquired as it is assumed that it will cover the resources more comprehensively in particular service delivery (20).

Limitations of the Research

The data of the study is limited to a tertiary university hospital in Turkey. Similar studies should be carried out in secondary-level public hospitals and private hospitals throughout the country. This study is limited to the treatment costs of COVID-19 disease borne by

SSI. The total cost of disease should be analyzed from different perspectives by paying attention to one perspective and direct medical costs and indirect non-medical costs. Also, in our study, the determination of the daily and per-patient cost of the disease is approximate.

Nevertheless, each hospitalized patient for the same disease consumes hospital resources (cost factors) in different ways. The price policy of CIH (HPS) created by SSI is not suitable for this. Each element of chest diseases (diseases and comorbidities such as pulmonary thromboembolism, asthma, COPD, pneumonia, lung cancer, tuberculosis) were not evaluated separately, but all chest diseases were taken into account in the study. Nonetheless, the examination, diagnosis, workup, and imaging expenses of the patients admitted to the Emergency for diagnosis and identification of the disease were not included in the scope. Besides, the costs of the patients after their transfer to the intensive care unit were excluded from the study.

Analysis of Data

In the first stage of the research, the assumption of normality was examined to determine the tests to be used in the data analysis. When the normality assumptions of the data were examined, it was determined that the kurtosis value of the variables was between 6.57 and 11.58 and the skewness value was between 16.93 and 222.18. As the kurtosis and skewness values were outside the ± 1.5 range, it was accepted that the assumption of normality distribution was not met (21). Mann-Whitney U test was used to analyze the difference between the two groups, and Spearman Correlation Analysis was used to test the relationships. Analyzes were made with the help of the SPSS 21.00 package program. The threshold value, in terms of statistical significance, was accepted as $p< 0.05$.

RESULTS

The findings of the patients treated in the DUHARH Chest Diseases unit before the COVID-19 pandemic (March 10, 2019-March 10 2020) and after (March 11 2020-March 11 2021) are given below.

Before the COVID-19 pandemic, a total of 16.797 patients applied to the Chest Polyclinic. Of these, 8.977 (53.4%) were males and 7.820 (46.6%) were females. The average cost for each sex was 46 TL ($8.14). The average age was determined as 54 years.

After the COVID-19 pandemic, a total of 9.642 patients applied to the Chest Polyclinic. Of these, 5.390 (55.9%) were males and 4.252 (46.6%) were females. The average cost was 64 TL ($9.23), and the cost for women (66 TL-$9.42) was higher than for men (63 TL-$9). The average age was determined as 54 years.

Before the COVID-19 pandemic, a total of 1.616 patients were hospitalized in the Chest Clinic. Of these, 1.057 (65.47%) were males and 557 (34.53%) were females. The median cost was 1.139 TL ($200) and 1.200 TL ($211.64) for men and 1.024 TL ($180.60) for women. Mean age of the patients was 60 years, and mean hospital stay was 3.18 days. The average daily hospitalization cost was 357.25 TL/day ($63) (1.139,64 TL/3.18 days).

After the COVID-19 pandemic, a total of 1.355 patients were hospitalized in the Chest Clinic. Of these, 917 (67.7%) were males, and 438 (32.3%) were females. The average cost was 2.136 TL/patient ($304.75), which was 2.119 TL ($302.28) for men and 2.170 TL ($309.56) for women. Mean age of the patients was 60 years, and mean hospital stay was 4.10 days. The average daily hospitalization cost was 521.04 TL/day ($74.33) (2.136.27 TL/4.10 days).

Of the 1.355 patients in the post-pandemic service, 326 were diagnosed with COVID-19, of which 196 (60%) were males, and 130 (40%) were females. Mean age of these patients was 67.41 years, mean cost was 5.534,04 TL/patient ($789.45), and mean hospital stay was 6.72 days. The average daily hospitalization cost was 823.52 TL/day ($117.48) (5.534,04 TL/6.72 days).

The total cost in the policlinic before the COVID-19 pandemic was determined to be 775.056,83 TL ($136.694,36), the average unit cost to be 46.14 TL ($8.14), and after the COVID-19 pandemic, the total cost was determined to be 623.718,45 TL ($88.975,53) and the average unit cost to be 64.69 TL/patient ($9.23). While the total cost was calculated as 1.841.659,00 TL ($324.807,58) in the pre-COVID-19 pandemic service, the average unit cost was calculated as 1.139,64 TL/patient ($200.00). After the COVID-19 pandemic, the total cost at the service was 2.894.647,00 TL ($412.931,10), and the average unit cost was 2.136,27 TL/patient ($304.75). The total cost at the service of COVID-19 Diagnosed Service Patients was 1.804.097,36 TL ($257.360,54), and the average unit cost was 5.534,04 TL/patient ($789.45) (Table 1).

Table 1. Total cost, average unit cost and number of patients of the chest diseases unit

	Policlinic		Service (All patients)		COVID-19 Diagnosed Service Patients
	Before Pandemic	After Pandemic	Before Pandemic	After Pandemic	
Total Cost (TL)($)	775.056,83 (136.694,36)	623.718,45 (88.975,53)	1.841.659,00 (324.807,58)	2.894.647,00 (412.931,10)	1.804.097,36 (257.360,54)
Patient Number	16.797	9.641	1.616	1.355	326
Average Unit Cost (TL/patient) ($)	46,14 (8.14)	64,69 (9.23)	1.139,64 (200.00)	2.136,27 (304.75)	5.534,04 (789.45)

Total costs before and after the COVID-19 pandemic were statistically compared. After the COVID 19 pandemic, the total cost in policlinic (U= 4.4960, p= 0.00) and service (U= 862938.5, p= 0.0) was statistically significantly higher than before the COVID 19 pandemic (Table 2).

While the total costs before the COVID-19 pandemic in the Chest Diseases Policlinic did not differ statistically according to sex (U= 3.478; p= 0.25), it differed (U= 1.1206; p= 0.03) afterwards, the cost of women was found to be higher than men (Table 3).

No correlation was found between the age of the patients who applied to the policlinic before the COVID-19 pandemic and the total cost (rho= -0.012, p= 0.135) (Table 4).

No correlation was found between the age of the patients who applied to the policlinic before the COVID-19 pandemic and the total cost (rho= -0.012, p= 0.135) (Table 5).

The total costs of patients hospitalized in the Chest Diseases Service before the COVID-19 pandemic (U= 291505.0; p= 0.68) and after (U= 192572.5; p= 0.220) did not differ statistically in line with the sex variable (Table 6).

There was a statistically significant positive correlation between the ages of the patients who applied to the Chest Diseases Service before the COVID-19 pandemic, hospitalization period, and their total costs. As age (rho= 0.479, p= 0.000, p< 0.01) and hospitalization period (rho= 0.799, p= 0.000, p< 0.01) increases statistically, so did the costs of the patients admitted to the clinic. At the same time, hospitalization period increased with age (rho= 0.475, p= 0.000, p< 0.01) (Table 7).

There was a statistically significant positive correlation between the ages of the patients admitted to the Chest Diseases Service after the COVID-19 pandemic, hospitalization period, and the total costs, as before (Table 8). As age (rho= 0.474, p= 0.000, p< 0.01) and hospitalization period (rho= 0.852, p= 0.000, p< 0.01) increased statistically, as did the costs of the patients admitted to the clinic. Similarly,

Table 2. Mann-Whitney U test results on total costs before and after the COVID-19 pandemic

	Total Cost (TL)	N	Row Average	Row Total	U	p
Policlinic	Pre-COVID-19	16797	11075,71	1.8603	4.4960	0.00
	Post-COVID-19	9641	16955,50	1.6348		
Service	Pre-COVID-19	1616	1342,50	2169474,50	862938,5	0.00
	Post-COVID-19	1355	1657,15	2245431,50		

Table 3. Mann-Whitney U test results regarding the sex variable in total costs in the policlinic before and after the COVID-19 pandemic

	Sex	N	Average	Row Average	Row Total	U	p
Total Cost (TL) before COVID	Male	8977	46.21	8363,48	75078987,00	3.478	0.25
	Female	7820	46.06	8439,77	65999016,00		
Total Cost (TL) after COVID	Male	5390	63.54	4774,61	25735165,00	1.1206	0.03
	Female	4252	66.15	4880,94	20753738,00		

Table 4. The relationship between total cost and age at the clinic before the COVID-19 pandemic

Spearman's rho		Age	Bill Total
Age	Correlation Coefficient	1.000	-0.012
	p	.	0.135
	n	16797	16797
Total Cost (TL)	Correlation Coefficient	-0.012	1.000
	p	0.135	.
	n	16797	16797
Average		54.06	46.14
Standard Deviation		17.54	39.47

Table 5. The relationship between total cost and age at the clinic after the COVID-19 pandemic

Spearman's rho		Age	Total Cost (TL)
Age	Correlation Coefficient	1	-0.027**
	p		0.008
	n	9642	9642
Total Cost (TL)	Correlation Coefficient	-0.027**	1
	p	0.008	
	n	9642	9642
Average		54.00	64.69
Standard Deviation		16.54	78.51

** p< 0.01.

Table 6. Mann-Whitney U test results for the sex variable in total costs in service before and after COVID-19

	Sex	N	Average	Row Average	Row Total	U	p
Total Cost (TL) before COVID	Male	1058	1.200,63	803,02	851716.0	291505,0	0.68
	Female	558	1.024,00	815,09	454820,0		
Total Cost (TL) before COVID	Male	917	2.119,72	669,00	613475,50	192572,5	0.220
	Female	438	2.170,92	696,84	305214,50		

hospitalization period increased with age (rho= 0.417, p= 0.000, p< 0.01) (Table 8).

DISCUSSION

According to the findings obtained from the chest diseases policlinic, it is observed that there was a 43% decrease in the number of policlinic patients after the pandemic, while there was a 20% decrease in the total costs. In addition, it was observed that there was a 39% increase in the average cost per patient (Table 1). Per that, despite a decrease in the number of patients after the pandemic, it was determined that there was an increase in costs per patient. There was no change in the mean age of the patients who applied to the policlinic (54 years).

In line with the findings obtained from the chest diseases service, 65% of the patients who applied to the chest clinic before the pandemic were males, 35% were females, and this rate was 67% in men and 32% in women after the pandemic. It was observed that 2/3 of the patients hospitalized in the clinic were males. After the pandemic, the number of clinical patients decreased by 16%, but 57% in total costs increased. Besides, it was observed that there was an 88% increase in the average cost per patient (Table 1). According to this, although the decrease in the

Table 7. The relationship between total cost, length of hospitalization, and age in service before COVID-19

Spearman's rho		Total Cost (TL)	Hospitalization Period (Days)	Age
Total Cost (TL)	Correlation Coefficient	1.000	0.799**	0.479**
	p	.	0.000	0.000
	N	1616	1616	1616
Hospitalization Period (Days)	Correlation Coefficient	0.799**	1.000	0.475**
	p	0.000	.	0.000
	N	1616	1616	1616
Age	Correlation Coefficient	0.479**	0.475**	1.000
	p	0.000	0.000	.
	N	1616	1616	1616
Average		1.139,64	3.19	60.18
Standard Deviation		2.484,27	3.60	16.76

**p< 0.01.

Table 8. The relationship between total cost, length of hospitalization, and age in service after COVID-19

Spearman's rho		Age	Total Cost	Hospitalization Period (Days)
Age	Correlation Coefficient	1.000	0.474**	0.417**
	p	.	0.000	0.000
	N	1355	1355	1355
Total Cost (TL)	Correlation Coefficient	0.474**	1.000	0.852**
	p	0.000	.	0.000
	N	1355	1355	1355
Hospitalization Period (Days)	Correlation Coefficient	0.417**	0.852**	1.000
	p	0.000	0.000	.
	N	1355	1355	1355
General Average		60.18	2136,27	4.10
Standard Deviation		16.47	3428,12	4.42

**p< 0.01.

number of service patients after the pandemic, it is seen that there is an increase in the costs per patient. The mean age of patients admitted to the clinic after the pandemic did not change (60 years). The average hospitalization period increased from 3.19 days to 4.10 days. This shows that after the pandemic, the average hospitalization day increased by 29% and extended by 1 day (Tables 4, 5). Other than that, the average daily hospitalization cost increased by 46%.

After the pandemic, in which most of the patients who applied to chest diseases were men, according to the sex of the patients, there was a 2% increase in the applications to both policlinics and clinics compared to women. In addition, it was determined that 2/3 of the patients hospitalized in the clinic after the pandemic were males. The high number of male patients is that COPD and lung cancer, which constitute the majority of the patient profile and in which smoking plays an important role, are more common in men (22,23). Another reason is that COVID 19 is more severe and fatal in men, like in COPD and lung cancer.

In DUHARH, fewer number of patients were diagnosed and treated due to the limited policlinic services because of both the concerns of the patients about the transmission of COVID-19 infection and the shift of the intensive service to pandemic services and policlinics, the number of non-COVID-19 diseases and outpatient clinic applications decreased (Table 1). In line with that, patients were encouraged by the Ministry of Health to receive health services from their family physicians, non-urgent elective surgical procedures were planned on a more suitable date as possible, and visitor restriction measures were taken (24).

This decrease in the number of patients also caused delay in diagnosis and treatment of non-COVID-19 diseases. It is thought that these delays during the pandemic period affected the costs negatively, as there were patients who had to apply because their complaints were advanced, and there were patients who needed advanced examination and treatment. Besides, the age and hospitalization period of these patients increased, thus increasing the costs.

After the pandemic, 24% (326) of the patients in the service were diagnosed with COVID-19, of which 196 were men and 130 women. Mean age of these patients was 67.41 years, the mean cost was 5.534,04 TL/patient ($789.45), and mean hospital stay was 6.72 days. This also shows that the hospitalization period of the patients diagnosed with COVID-19 hospitalized in the service was 2.62 days longer than the general average (4.10 days). The age was 7.41 years longer than the general average (60 years), and accordingly, the fact that the costs are 3.397,77 TL/patient ($484.70) (159% on TL basis, 60% on $basis) compared to the general average cost (2.136,27 TL - $304.75) is another most crucial reason that increases the costs after the pandemic.

As the pandemic process gets longer, it is observed that there is a decrease in non-pandemic patients who applied to the policlinic. This situation causes morbidity and mortality in these patients due to delays in the diagnosis of non-COVID 19 patients. In this course, by sharing the duties of health service providers between hospitals on a regional basis, specific hospital(s) can be allocated only to non-COVID 19 patients, and safer polyclinical and clinical services can be provided to these patients.

Hacıevliyagil et al. (2006) have calculated, in their study, that the average hospitalization costs are 1.978 TL for lung cancer, 1.479 TL for pneumonia, 1.336 TL for COPD, 925 TL for asthma, and Göksel et al. (2010), in their study, have calculated the cost per patient with lung cancer is 3.168,20 TL in terms of 2007 prices.

Çelik et al. (2004) have determined that the average annual direct medical cost of asthma was 1.904 TL per person, and the majority of the total direct costs (81%) were because of the cost of drugs.

In their studies, Doruk et al. (2009) there is inadequate data about the direct or indirect cost of community acquired pneumonia (CAP have calculated that the mean hospitalization for community-acquired pneumonia was 11.0 ± 6.6 days, average drug cost is 484.59 Euro, radiology cost was 65.38 Euro, laboratory cost is 329.38 Euro, and the total cost was 1630.77 Euro but the effect of sex and advanced age (≥65 years) on total cost could not be determined.

Tanrıverdi (2013) has determined that the average annual hospitalization rate of patients with COPD is 1.6/year, and the average total hospitalization cost is 1100 ± 618 TL. There was a weak correlation between age and mean hospitalization period (r= 0.125, p= 0.004) and costs (r= 0.144, p= 0.001). There was no significant difference between male and female sexes in terms of costs and hospitalization period.

Çeldir Emre et al. (2014) have determined in their study that asthma patients were hospitalized for an average of 8.5 ± 4.6 days, they had an average total cost of 923.8 ± 562.2 TL (513.2$ ± 312.3$; 401.7€ ± 244.4€) during this period and when the cost components are examined, the average cost of the total bed was 263.1 ± 144.7 TL (146.2$ ± 80.4$; 114.4€ ± 62.9€), the mean cost of the drug was 453.4 ± 325.9 TL (251.9$ ± 181.1$; 197.1€ ± 141.7€), the total cost values increased as the age increased, but it was not at the level of statistical significance.

In the study of Bozdemir et al. (2021) from the perspective of SSI in Düzce University Hospital, it has been determined that the average daily hospitalization cost of patients hospitalized in the pandemic service and intensive care unit due to COVID 19 disease is ± 2.099,80 TL/day ($300), and age harmed costs.

The findings acquired from these studies conducted in Turkey and the findings obtained from our study show approximately similar results.

CONCLUSION

During the pandemic, in DUHARH chest diseases units, due to the limited policlinic services because of both the concerns of the patients about the transmission of COVID-19 infection and the shift of the intensive service to the pandemic services and policlinics, the number of non-COVID-19 diseases and outpatient clinic applications decreased. Despite this decrease, costs per patient have increased both in policlinics and services. It is thought that the most crucial reason for the increase in costs is the fact that patients who need advanced examination and treatment applied during the pandemic period, and in line with that, the hospitalization period and the high costs of patients diagnosed with COVID-19. During COVID-19 disease, patients need to apply early without further examination and treatment.

Ethical Committee Approval: This study was carried out with the Republic of Turkey Ministry of Health (application no:2021-06-07T18_57_04) and Düzce University Non-Interventional Health Research Ethics Committee (Decision no: 2021/151).

CONFLICT of INTEREST

The authors of this case-analysis declare that they have no conflict of interest.

AUTHORSHIP CONTRIBUTIONS

Concept/Design: All of authors

Analysis/Interpretation: EB, DŞ

Data Acqusition: ZK

Writing: EB

Clinical Revision: EGB, AÖB, ANA

Final Approval: All of authors

REFERENCES

1. *T.C. Sağlık Bakanlığı. COVID-19 (SARS-CoV-2 Enfeksiyonu) Genel Bilgiler Epidemiyoloji ve Tanı. Bilimsel Danışma Kurulu Çalışması. 2020. Available from: https://covid19.saglik.gov.tr/TR-66337/genel-bilgiler-epidemiyoloji-ve-tani.html 27.06 2021 (Access date: Jun 27 2021)*
2. *Annakaya A, Yıldız Gülhan P, Güleç Balbay E, Balbay ÖA, Arbak P. Göğüs hastalıkları kliniği, pandemi tecrübeleri. Konuralp Tıp Derg 2020; 12(S1): 361-63. https://doi.org/10.18521/ktd.757116*
3. *Jo C. Cost-of-illness studies: concepts, scopes, and methods. Clin Mol Hepatol 2014; 20(4): 327-37. https://doi.org/10.3350/cmh.2014.20.4.327*
4. *Segel J. Cost of illness studies - a primer. RTI-UNC Cent Excell Heal Promot Econ 2006; 1: 39.*
5. *Bozdemir E. Sağlık İşletmelerinde Maliyet Muhasebesi ve Analizi. Gazi Kitabevi: Ankara, 2019.*
6. *Yıldırım N. Hastaneye yatırılan koah alevlenmelerinin tedavi maliyetlerini etkileyen klinik faktörler. Eurasian J Pulmonol 2014; 16(3): 210-1. https://doi.org/10.5152/ejp.2014.96630*
7. *Tanrıverdi H. Erzincan devlet hastanesinde KOAH'lı hastaların doğrudan maliyet analizi. Duzce Med J 2013; 15(2): 15-8.*
8. *Kokkotou E, Stefanou G, Syrigos N, Gourzoulidis G, Ntalakou E, Apostolopoulou A, et al. End-of-life cost for lung cancer patients in Greece: A hospital-based retrospective study. J Comp Eff Res 2021; 10(4): 315-24. https://doi.org/10.2217/cer-2020-0167*
9. *Sari AA, Rezaei S, Arab M, Majdzadeh R, Matin BK, Zandian H. Effects of smoking on cost of hospitalization and length of stay among patients with lung cancer in Iran: A hospital- based study. Asian Pacific J Cancer Prev 2016; 17(9): 4421-6.*
10. *Ihbe Heffinger A, Paessens B, Berger K, Shlaen M, Bernard R, von Schilling C, et al. The impact of chemotherapy-induced side effects on medical care usage and cost in German hospital care-an observational analysis on non-small-cell lung cancer patients. Support Care Cancer 2013; 21(6): 1665-75. https://doi.org/10.1007/s00520-012-1711-5*
11. *Perin J, Zarić B, Đođić JE, Potić Z, Potić M, Sekeruš V, et al. The cost of hospital treatment of advanced stage lung cancer patients in a developing South East European Country. J Cancer 2018; 9(17): 3038-45. https://doi.org/10.7150/jca.26278*
12. *Göksel T, Yılıdız P, Altın S, Başer S, Bayız H, Görgüner M, et al. Metintaş M. (ed) Türkiye'de Temel akciğer sağlığı sorunları ve çözüm önerileri. Türk Toraks Derneği, Sentez Matbaacılık ve Yayıncılık: Ankara, 2010.*
13. *Çeldir Emre J, Özdemir Ö, Baysak A, Aksoy Ü, Özdemir P, Öz AT, et al. Devlet hastanesi göğüs hastalıkları servisinde yatan hastalarda astım maliyeti. Asthma Allergy Immunol 2014; 12: 140-5.*
14. *Çelik GE, Bavbek S, Paşaoğlu G, Mungan D, Abadoğlu Ö, Harmancı E, et al. Direct medical cost of asthma in Ankara, Turkey. Respiration 2004; 71(6): 587-93. https://doi.org/10.1159/000081759*
15. *Hacıevliyagil SS, Mutlu LC, Gülbaş G, Yetkin Ö, Günen H. Göğüs hastalıkları servisine yatan hastaların hastane yatış maliyetlerinin karşılaştırılması. Toraks Derg 2006; 7(1): 11-6.*
16. *Doruk S, Tertemiz KC, Kömüs N, Uçan ES, Kilinç O, Sevinç C. Community acquired pneumonia and direct hospital cost. Tuberk Toraks 2009; 57(1): 48-55.*

17. *Park YS, Kim SH, Park SK, Park B-J, Kim YT, Lee S-M, et al. Costs for 5-year lung cancer survivors in A Tertiary Care Hospital in South Korea. Lung Cancer 2010; 68(2): 299-04. https://doi.org/10.1016/j.lungcan.2009.06.016*

18. *Gemicioğlu B, Dursun B, Mungan D, Yıldız F, Türktaş H, Yorgancıoğlu A. In: Metintaş M (ed). Türkiye'de temel akciğer sağlığı sorunları ve çözüm önerileri. Ankara: Türk Toraks Derneği, Sentez Matbaacılık ve Yayıncılık, 2010: 19-27.*

19. *Olsson TM. Comparing top-down and bottom-up costing approaches for economic evaluation within social welfare. Eur J Heal Econ 2011; 12(5): 445-53. https://doi.org/10.1007/s10198-010-0257-z*

20. *Cunnama L, Sinanovic E, Ramma L, Foster N, Berrie L, Stevens W, et al. Using top-down and bottom-up costing approaches in LMICs: The Case for using both to assess the incremental costs of new technologies at scale. Health Econ 2016; 25(2007): 53-66. https://doi.org/10.1002/hec.3295*

21. *Çokluk Ö, Şekercioğlu G, Büyüköztürk Ş. Sosyal bilimler için çok değişkenli istatistik SPSS ve LISREL uygulamaları. PEGEM Akademi: Ankara, 2012. 2. Baskı.*

22. *Caracta CF. Gender differences in pulmonary disease. Mt Sinai J Med 2003; 70(4): 215-24.*

23. *Townsend EA, Miller VM, Prakash YS. Sex differences and sex steroids in lung health and disease. Endocr Rev 2012; 33(1): 1-47. https://doi.org/10.1210/er.2010-0031*

24. *İşlek E, Özatkan Y, Bilir K, Arı HO, Çelik H, Yıldırım HH. COVID- 19 pandemi yönetiminde Türkiye örneği: sağlık politikası uygulamaları ve stratejileri. Meşe EA, Topaloğlu S, Aydın S, Erdem R, Ankara HG, Çelik H. (eds). TÜSPE: Ankara, 2020*

25. *Bozdemir E, Balbay Ö, Terzi M, Kaplan Z. Treatment cost analysis of COVID-19 inpatients treated at a university hospital In Turkey. Konuralp Tıp Derg 2021; https://doi.org/10.18521/ktd.905115*