Health Care Expenditures of Lung Cancer: A Turkish Experience

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Abstract

Lung cancer is by far the most common cancer among men in the world and in Turkey. In this study, by analyzing the hospital records of 83 patients who died because of lung cancer between 1998 and 2002, we aimed to estimate the health care expenditures associated with the diagnosis and treatment of lung cancer patients at a university hospital.

The total amount spent for lung cancer diagnosis and treatment per patient was estimated as 8257.-$ and the majority of this cost consisted of "treatment costs". In this group of patients, mean duration between the onset of symptoms and time of diagnosis was 4.5 months, and mean survival after diagnosis was 7 months.

Since there are almost 10 000 new lung cancer cases annually in Turkey, it was calculated that 81 million dollars is required for diagnosis and treatment costs of the disease, an amount much greater than what would be needed to initiate effective primary preventive strategies focusing on tobacco control such as "not starting to smoke" or "quitting smoking".

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Introduction

Lung cancer is by far the most common cancer among men and it is in first place in the world and in Turkey (1,2,3). Approximately 10 000 cases of lung cancer occur every year in Turkey (1).

It is well known that smoking is the major attributable risk factor of lung cancer (4). Like many other developed and developing countries, smoking is very common among Turkish population and currently, almost 45.3% men and 18.3% women are smokers (5). Studies focusing on tobacco control such as smoking cessation and primary prevention strategies are certainly needed to prevent the increasing trend in the incidence of lung cancer (6).

Interest in the medical costs of cigarette smoking derives from the desire to identify the economic burden that smoking imposes on a society (7).

In the USA, health care expenditures for lung cancer patients was reported as 29 000 US$ dollars per inpatient from diagnosis to death (8). The annual national health expenditure within the total budget in Turkey was 0.85% in 2002, which equals to 1.6 trillion dollars. At present, the amount in the budget which is allotted to cover the management of cancer patients and smoking attributed diseases is not clear (1). It is therefore important to evaluate the resources required for lung cancer diagnosis and treatment (9).

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The dominating approach to measure the economic burden for society of illness is called the cost-of-illness (COI) analysis. It should be appropriate to distinguish between the three types of costs, namely, the direct, indirect and psychosocial/intangible costs. Direct costs result from the use of resources to prevent, diagnose and treat the disease in question, including the expenses associated with continuing care, rehabilitation and terminal care of patients. These include costs for the hospitalization, outpatient clinical care, services of primary-care physicians, specialists, nurses and other health care practitioners, drugs and other materials, etc. Indirect costs are related to time and production losses of the patients as well as of the family, friends and others as a consequence of the morbidity, disability or mortality associated with the disease. Finally, psychosocial or intangible costs are terms used to refer to a variety of defined effects of the disease. It is usually assumed that disease has a negative impact on the quality of life of the patients and the people around them. Estimation of this type is very difficult; therefore many researchers prefer to use direct medical costs (10-12).

In this study, our objective was to estimate the health care expenditures associated with the diagnosis and treatment of lung cancer patients at a university hospital in Ankara, Turkey during a two-year period from 1998 to 2002.

Materials and Methods

The hospital records of 83 patients who died because of lung cancer between the years of 1998 and 2002 were assessed. Five of these patients had been followed on an outpatient basis and were not included in the cost analysis. Patients were diagnosed as lung cancer either after admission to the study hospital or referred to the study hospital with a diagnosis of lung cancer. The study hospital was one of the leading university hospitals in Turkey located in Ankara.

The histological type of the cancer had been investigated in all cases. For the analysis of non-small-cell lung cancer, an internationally recognized cancer staging system-the TNM (Tumour, Node, Metastasis) system-was used. For small-cell lung cancer, the Veterans Administration Lung Group classification system was used. This classification defines two stages (limited and extensive), according to whether the disease is confined to one hemitorax and/or to the regional lymph nodes.

The expenses were recorded in different subcategories since not all patients benefited from the same insurance system. Some benefited from state social insurance institutions, others had private insurance. If the patients did not have any social insurance, the computer output of their bill that the hospital administration had given was used. "Health index" of the "State Statistical Institute" was used to convert the expenses to the present price equivalence. Diagnosis and treatment expenses were analyzed separately. Expenditures of the patients regarding other health problems were not included in the analysis.

Diagnostic costs included health care expenditures, biochemistry-pathology expenditures, radiological- microbiological diagnostic tests and surgery expenditures.

Treatment expenses included health care expenditures, follow up biochemistry-pathology expenditures, radiotherapy, other radiological- microbiological follow up diagnostic tests and surgery expenditures.

Health care services included physician consultations, nursing services, interventions such as aspiration of bone marrow, tracheal aspiration, monitorization, application of intravenous medication, and medication, blood and blood supplies, hospitalization and intensive care costs.

Excel 97 and SPSS 10.0 statistical programs were used in data entry and analysis.

Results

The demographic and other characteristics of the patients are given in Table 1. The majority of the patients were males (86.6%). Almost 6 out of 10 were 55 years old and older (61.4%). Only 37 out of 83 participants reported their profes-

Table 1. Socio-demographic characteristics of the participants

Characteristics	Number	%
Sex (n=83)		
Male	72	86.6
Female	11	13.4
Age Groups (n=83)		
<45	9	10.8
45-54	23	27.8
55-64	27	32.5
>64	24	28.9
Mean (±SD)	57.94 (±10.90)	
Median	59	
Range	27-79	
Profession (n=37)		
Retired	13	35.2
Housewife	6	16.2
Worker	3	8.1
Others	15	40.5
Type of Social Insurance Coverage for Health Expenditures (n=83)		
Government Employees Retirement Fund	47	56.6
Social Security Organization	34	41.0
Green Card	1	1.2
Private Health Insurance	1	1.2

sions. All of them were covered by a social insurance system. The majority of the patients reported that they were "current smokers" (89.2%). Of these, 60.8% smoked more than one pack (20) of cigarettes daily. The duration of smoking ranges from 21 to 40 years and the majority of the patients had smoked for more 20 years (Table 2).

Table 2. Smoking characteristics of the participants

Characteristics	Number	%*
Smoking status (n=83)		
Current smoker	74	89.2
Non-smoker	9	10.8
Total	83	100.0
Cigarettes smoked per day (number) (n=74)**		
<15	2	2.7
15-24	46	62.2
>24	26	35.1
Total*	74	100.0
Duration of smoking (year) (n=74)***		
<21	8	10.8
21-40	45	60.8
41-60	21	28.4
Total*	74	100.0

*Column percentage

Mean daily number of cigarettes smoked daily: 25.8±11.4; range: 5-90; median: 20.*Mean years of smoking: 35.4± 10; range:10-65; median: 35.

Mean time elapsed between the onset of symptoms and time of diagnosis was 4.5 months. Mean period of survival after diagnosis was 7 months.

Analysis of the records of 78 inpatients diagnosed as lung cancer showed that the total amount spent for lung cancer diagnosis and treatment per patient was 8257.-$. "Treatment costs" constituted the main part of this cost (Table 3).

Diagnosis and treatment costs were investigated in detail. "Health care services" including physician consultations, nursing care services, drugs, intensive care services, and hospitalization costs were in the first rank (34.0%) of the total diagnostic costs. The other expenditure items were "biochemistry (22.0%)", "radiology (21.0%)", "surgery (10.0%)", "microbiology (10.0%)", and "pathology (3.0%)". Similarly, "health care services" were in the first rank (58.0%) within the treatment costs. The other expenditure items were "biochemistry (19.0%)", "radiology (10.0%)", "surgery (7.0%)", "microbiology (5.0%)", and "pathology (1.0%)" (Figures 1 and 2).

Table 3. Health expenditures of patients with lung cancer

Health expenditure (US$) (n=78)	Per person	Per inpatient admission	Per day spent at hospital
Diagnosis	1015	416	31.7
Treatment	7242	2968	229
Total	8257	3384	261

"Health care services for treatment" consisted of medication other than chemotherapeutic agents (31.0%); blood and blood products (27.0%); radiotherapy (16.0%); intensive care and hospitalization expenditures (10.0%) and surgery and associated costs (10.0%).

Total health expenditure increases as duration of hospitalization increases. This relationship was reported to be statistically significant after adjustment for age (Pearson χ^2 17.714, p=0.01).

Discussion

Almost one out of three (27.7%) inpatients diagnosed with lung cancer was between 55-64 years of age, and 28.9% of them were 65 years of age and older. Similar results were reported in different studies. For example, in a study conducted in Canada in 1997, 87.0% of the patients were over 65 years of age (9). In US, five years lung cancer incidence (1987-1992) was 28/100 000 among people under the age of 65 years whereas it was 330/100 000 among the older group (13). Although "lung cancer" is more frequent among middle and older age people, the majority of the patients start to smoke at very young ages.

According to US reports the most frequent (90.0%) cause of lung cancer is tobacco and tobacco products (4). In a Turkish study conducted by Bilir et al. in 1996, mean age of starting to smoke was found to be 14 among high school students, which suggested that the age of starting smoking was gradually decreasing (14). Currently, 45.3% of the males and 18.3% of the females are smokers in the country (5).

Quitting smoking may not be easy even among inpatients with lung cancer. Although they have experienced many negative and complex feelings due to their biological illness, the majority continue to smoke (89.9%). In our study, 60.8% of the smokers who smoked more than 20 cigarettes daily stated that they had smoked for more than 20 years (Table 2). Within the community, a noteworthy number of people are not aware of the health risks of smoking. In a study conducted among 2700 British smokers and 1200 non smokers aged 16-66 years, 45.0% of the smokers rejected outright the concept that because of their smoking they were more liable to heart disease and 33.0% rejected that smoking made them more prone to lung cancer. Overall, only 14.0% of the participants completely accepted the idea that smoking causes heart disease, and 11.0% of them agreed with the statement

Table 4. Total health expenditures by some characteristics of the patients

Characteristics	Health Expenditure (x 1000 US$)				
	< 7	8-14	15-30	Total*	p
	n (%)	n (%)	n (%)	n (%)	
Sex (n=83)					0.89
Male	42 (58.3)	20. (27.8)	10 (13.9)	72 (86.7)	
Female	7 (63.6)	3 (7.3)	1 (9.1)	11 (13.3)	
Total	49 (59.0)	23 (27.7)	11 (13.3)	83 (100.0)	
Duration of hospitalization (days) (n=78)**					
1-30	34 (68.0)	14 (28.0)	2 (4.0)	50 (64.1)	0.01[a]
31-60	10 (55.6)	3 (16.7)	5 (27.8)	18 (23.1)	
61 and over	1 (10.0)	5 (50.0)	4 (40.0)	10 (12.8)	
Total	45 (57.7)	22 (28.2)	11 (14.1)	78 (100.0)	
Period from diagnosis to death (month) (n=83)					
<1	12 (85.7)	1 (7.1)	1 (7.1)	14 (16.8)	0.19
1-6	21 (58.3)	10 (27.3)	5 (13.9)	36 (43.4)	
7-12	12 (63.2)	5 (26.3)	2 (10.5)	19 (22.9)	
13-18	–	2 (66.7)	1 (33.3)	3 (3.6)	
19 and over	4 (36.4)	5 (45.4)	2 (18.2)	11 (13.3)	
Total	49 (59.0)	23 (27.7)	11 (13.3)	83 (100.0)	

*Column percentage, others were row percentage

**5 patients were outpatients

a Linear regression analysis, adjusted for age (Pearson χ^2 18.173, p=0.01)

that smoking causes lung cancer (15).

Lung cancer and other smoking related diseases are an extremely high economic burden for the society. The results of a peer reviewed literature on medical costs of smoking in the US indicated that at least 6-8% of the annual personal health expenditures in the US was devoted to treating diseases caused by smoking (7). In another study conducted in Japan in 1990, the psychosocial cost of the 115 000 deaths due to smoking related diseases was estimated to be 56 billion US$. Thirty two billion US$ out of the total cost was medical costs; 20 billion US$ was cost related to productivity losses. In the same study, 29 000 out of 115 000 deaths were reported to be lung cancer cases (16).

In our study, we limited our estimation to diagnostic and treatment health care expenditures of lung cancer patients from 1998 to 2002 at a university hospital. Estimation of this type was easier for us compared to the estimation of the "indirect" and "psychosocial" costs mainly because the data for these estimations were not available. Although we recognize the need for studies focusing on estimations of "indirect" and "psychosocial" costs, our study has also yielded significant results.

The total amount of money spent for lung cancer diagnosis and treatment per person was calculated as 8257$ and the majority of this cost consisted of "treatment costs" (Table 3). In our series, the average duration between the onset of symptoms and time of diagnosis was 4.5 months, and average survival after diagnosis was 7 months. In the US, total cost per inpatient from diagnosis to death was estimated as 29 000 US$ and average survival after diagnosis was 19 months (8). Compared to the US, medical costs are cheaper in Turkey. The fact that most of the patients in Turkey are diagnosed at later stages (stage 3-4) might have been a cause of the shorter survival for the disease. At this point, it is clear that strategies for early diagnosis and treatment of lung cancer should be improved within our health system. Our

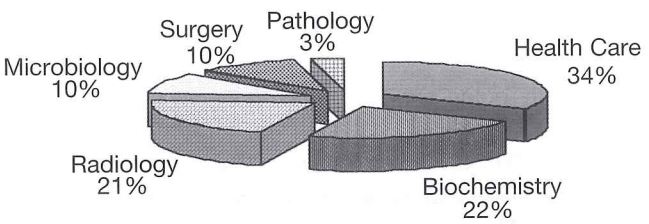

Figure 1. *Diagnostic health expenditures of lung cancer (Ankara, 1998-2002).*

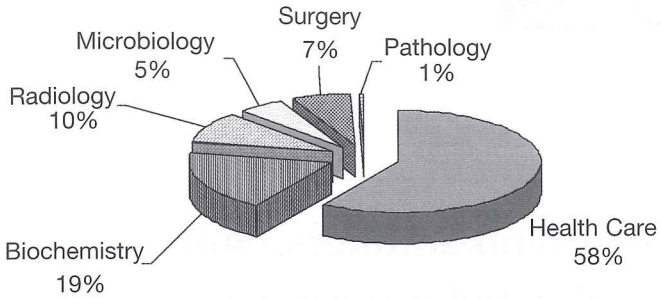

Figure 2. *Treatment health expenditures of lung cancer (Ankara, 1998-2002).*

study also showed that starting treatment after diagnosis took almost one month. In another study from the northern part of Turkey, treatment was started 47 days after the diagnosis (17). Health expenditures increase with length of hospitalization as well as with delays in starting treatment.

Diagnostic and treatment costs were investigated in detail, as shown in the Tables. "Health care services" including physician consultations, nurse care services, drugs, intensive care services, hospitalization costs were in the first rank (34.0%) among the diagnostic costs.

In our study, total health expenditure for one patient was estimated to be 8257.- US$. There are almost 10 000 new lung cancer cases reported for the year 2003, and 81 million dollars is required for the diagnosis and treatment costs of these patients. At this point, we should emphasize the obvious fact that primary preventive strategies focusing on tobacco control such as "not starting to smoke" or "quitting smoking" cost a lot cheaper than measures for secondary and tertiary preventions.

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