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Original Article

Asthma Economic Costs in Adult Asthmatic Patients in Tehran, Iran

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Abstract

Background: High prevalence and increasing rate of asthmatic patients around the word witnesses the high burden of asthma. We have limited data on asthma burden and economic costs in Iran. This study aimed to find direct and indirect economic costs of asthma and their association with some background factors in one of the referral tertiary centers for adult patients with asthma.

Methods: We surveyed asthma related economic costs of 197 adult patients who referred to Milad Hospital, Tehran, Iran from Jun 2007 to January 2010. The patients were followed up for a period of one-year ±1 month and asthma related costs and its control status were registered.

Results: Patients were consisted of 125 (64.1%) females and 70 (35.9%) males. Total cost of asthma was 590.22 ±32.18 USD for one patient per one year, the cost of drug, paraclinic, doctor visit, hospitalization, emergency, transportation, and absent days were 327.02, 4.76, 35.44, 3.82, 0.26, 113.03, 105.89 USD respectively. Men showed a significant elevation in their total (P=0.009) and drug costs (P=0.028). In addition, we found significant differences between total asthma costs and asthma control status (P=0.002).

Conclusions: According to the high proportion of asthma, related cost compare to Total Income of an Iranian family, the necessity of public coverage of health assurance is quite clear. We suggest that improving asthma management and accessibility to specialized treatment centers can result in decreasing asthma medication and transportation costs as major direct and indirect asthma related costs.

Keywords: Iran, Asthma, Direct cost, Indirect cost

Introduction

Asthma is a chronic and obstructive respiratory disorder that takes place in response to triggers such as viral infections, allergens and exercise and lead to acute symptomatic attacks of bronchial constriction that affects adults and children of all ages (1).

Nearly, 300 million asthmatic patients are present all around the world with different racial and ethnical backgrounds. This high prevalence and increasing rate of asthmatic patients, emphasis on the high burden of asthma to health care systems of countries and families (2).

Calculation of the economic cost of the diseases is used for determining the burden of diseases in communities. The total disease related economic cost is the collected of direct costs and indirect costs, direct costs are related to the medical treatments and indirect costs are associated to non-

medical expenditures but they are the results of the disease like transportation expenses or work/school absent days that patient or his/her parents miss because the disease (3). The economic asthma costs are significant in both direct medical costs such as hospitalization and medication and indirect medical costs such as time absent days and premature death (2).

Some studies have given estimation of patient's asthma costs in different Western countries in order to show the economic burden on patients (4). It can be expected in developed countries that one to two percent of health care budget expend for asthma (2). WHO reported in 2004 that economic cost of asthma is more than tuberculosis and HIV/AIDS all together (5). In the United States, the total direct medical and indirect economic costs of asthma such as miss school or work days, lost productivity and premature retirement were $12 billion in 1994 that show a 50% increasing from 10 years before that time that it was found that indirect economic costs rising was responsible for this intensification (6).

Based on report of Global Initiative for Asthma (GINA) in 2004, 5.5% of Iranians were asthmatic and it was estimated to increase in future (2) but we have little data on asthma burden and economic costs in Iran. In Iran, direct economic cost of acute asthma in emergency department was reported 15.23 ± 6.92 USD (7). In other study that also was carried out bout pediatric asthma related costs in Iran, the mean annual cost per child was approximately 466 dollars (8).

Documentation of the asthma related economic cost is important in understanding the burden of the illness, this data is necessary for decision-making and developing strategies for asthma management and control in each country. According to limited information about asthma linked costs in adult patients in Iran, we designed this study to fill this gap. For the pilot step, we choose one of the referral tertiary centers of diagnosis and treatment of asthma in adult population to calculate direct and indirect economic costs of asthma and their association with some background factors such as concomitant diseases, cigarette smoking and asthma control situation.

Materials and Methods

Study design

In this cross sectional study, we surveyed economic costs of 197 adult asthmatic patients' during June 2007 to January 2010. Patients had referred to Lung Disease Clinic of Milad Hospital, Tehran, Iran as one of the important tertiary referral centers for diagnosis and treatment of asthma. The inclusion criteria for the study was the age equal or over than 18 years and asthma diagnosis that was confirmed by the pulmonary subspecialist physician. The exclusion criteria were the presence of any other respiratory disease.

Questionnaire

In a face-to-face interview, a trained physician filled the questionnaire in the beginning of the study.

The first part of questionnaire was about demographic and background factors like age and sex, smoking status (active/passive/none), concomitant diseases such as allergic rhinitis, sinusitis, gastroesophageal reflux disease (GERD), nasal polyp, asthma duration and asthma control situations consist of complete controlled, partial controlled and uncontrolled asthma that was assessed base on GINA 2006 classification (9). The second part of questionnaire was about direct and indirect economic costs of asthma such as doctor visit, radiology, laboratory, spirometery, medication, emergency, hospital admission, transportation and work absent days with the purpose of asthma treatment and management. For convenience, all the costs were recorded in questionnaire as Rial, the official currency of Iran.

Patients follow up

After the first documentation, the patients were followed-up for a period of one-year ±1 month at the clinic and if it was not possible, they were followed-up by telephone and asthma related costs and control status were registered.

Data analysis and costs' calculation

Data were analyzed statistically by SPSS software version 16 (Chicago, IL, USA) and standard statis-

tical descriptions parameters like minimum, maximum, mean, and standard deviation were computed for each expenditure and finally direct and indirect costs were computed. In addition, asthma economic costs according to age, sex, asthma control status, comorbidities and smoking status were computed.

Chi square and fisher's exact tests applied for qualitative data and independent-samples T test and ANOVA, mann whitney and kruskall walis were used to compare means of expenditures. We considered *P* values less than 0.05 statistically significant. Two participants died during fallow up period because of non-asthma related reason, we excluded their incomplete data, and we analyzed base on 195 patients. Before the statistical analysis, all the costs were changed from Rial to United State Dollar (USD) according to the Iran Central Bank exchange rate (10).

Results

Totally 195 patients had successful one-year period fallow up that were consist of 125 (64.1%) female and 70 (35.9%) males. The youngest patient was 18 and the oldest one was 85 years old. Mean of age of patients was 53.18±1.00 years. Asthma duration of patients ranging from 1 to 70 years and mean of this period was 9.94±0.75 years. Patients had 1 to 17 times doctor visit during one year because of their asthma with mean of 7.02±0.16. The average of numbers of medical services that were needed for an asthmatic patient during one year are as follow: Chest X-ray 0.14±0.03 times, laboratory tests 0.11±0.02 times, spirometery 0.35±0.03times, emergency visit 0.03±0.01times, and hospitalization bed days 0.36±0.19 times. Mean of absent days because of asthma related problems were calculated 2.12±0.27 days.

Table 1: Parameters of annual asthma related costs (USD)

Annual costs		Minimum	Maximum	Mean	Std. error
Direct	drugs	13	3873	327.02	25.66
	paraclinic	0	31	4.76	0.49
	doctor visiting	5	85	35.44	0.85
	hospitalization	0	379	3.82	2.15
	emergency	0	30	0.26	0.18
Indirect	transportation	6	1995	113. 03	11.18
	Absent days	0	1200	105.89	13.61

Table 2: Distribution of asthma related costs according to sex

Annual costs	Sex	Minimum	Maximum	Mean	Std. error	*P* value
Drug	Male	42	3873	394.94	58.09	**0.028**
	Female	13	2019	288.98	22.87	
Paraclinic	Male	0	25	5.56	0.85	0.203
	Female	0	31	4.32	0.60	
Doctor Visit	Male	10	75	34.90	1.34	0.998
	Female	5	85	35.75	1.10	
Hospitalization	Male	0	99.75	4.36	2.43	0.384
	Female	0	379.05	3.51	3.07	
Emergency	Male	0	0	.00	.00	0.289
	Female	0	29.93	.39	0.29	
Transportation	Male	6	1995	139.19	29.54	0.546
	Female	8	359	98.37	5.34	
Absent days	Male	0	600	103.57	20.46	0.629
	Female	0	1200	107.20	17.94	
Total	Male	155	4142	713.78	80.62	**0.009**
	Female	56	2318	523.30	28.13	

Total cost of asthma was 590.22 ±32.18 USD, direct costs calculated 371.29±26.17 USD and indirect costs 218.92±18.17 USD for one patient per one year, relative frequency and details of expenditures are demonstrated in Fig. 1 and Table 1. The mean of total costs for women was 523.30±28.13 and for men was 713.78±80.62 (*P*=0.009), details of expenditures according to sex for drug, paraclinic (laboratory, radiology, spirometery), doctor visit, emergency, transportation absent days are shown in Table 2.

Comparison of means of total costs according to patients' age groups (equal and less than 45 years and more than 45 years) did not show any statistical differences (*P*=0.733).

Fifty-four (27.7%) patient had uncontrolled asthma, 99(50. 8%) were partly and 42(21.5%) were well-controlled asthma. Mean of total costs according to control status of asthma are shown in Table 3 and Table 4 demonstrate the control status according to sex.

The relative frequency of concomitant diseases and their associations with total asthma related costs are as follow: allergic rhinitis 54.9% (*P*=0.512), sinusitis 41% (*P*=0.178), gastroesophageal reflux disease (GERD) 37.9% (0.516), and nasal polyp 22.6% (*P*=0.051).

Among patients, 77.9% did not smoke cigarette, 5.6% were active smokers, and 16.4% were passive smokers we found no relation between smoking status and total asthma related costs (*P*=0.672).

Table 3: Asthma total cost according to control status

Control status	Number	Percent	Total costs (USD)	Std. error of mean	*P* value
Uncontrolled	54	27.7	708.20 [a*]	55.22	**0.002**
Partly controlled	99	50.8	572.50 [bc]	57.87	
Completely controlled	42	21.5	487.07 [c]	40.60	

*Common characters indicate none significant differences with each other.

Table 4: Distribution of asthma related costs according to control status of asthma and sex

Control status	Sex	Number	Percentage	Total costs (USD) Mean ± SE	*P* value
Uncontrolled	Male	20	37.0	663.00 ± 86.53	0.535
	Female	34	63.0	734.79 ± 72.01	
Partly controlled	Male	37	37.4	792.40 ± 142.17	**0.005**
	Female	62	62.6	441.28 ± 26.79	
Completely controlled	Male	13	30.9	568.18 ± 82.76	0.184
	female	29	69.1	450.72 ± 45.02	

Discussion

Asthma is described as a persistent inflammatory disease of the airways that distress individuals of all ages. Over the last decades, there has been a sharp rising in the prevalence, mortality, morbidity, and economic burden of asthma worldwide. Now 300 million people suffer from asthma in the world, and we will encounter with 50% increase in its prevalence every decade (2). In 2003, it was estimated that asthma causes nearly 239,000 deaths per year (11).

Asthma has a big impact on many aspects of patient's life as well as work, sleep, learning, and sometimes doing exercise (12) and its level of disability is equal to diabetes (2). In 2005 in Europe, the total cost of asthma was reported near to €17.7 billion per year, indirect cost of absence from work was reported €9.8 billion that was consist of 55.36% of total costs (13). In European lung white book in 2003, Europe anti asthmatic drug was account 4.4 billion USD that was just 20.32% of total asthma related costs (14). Phar-

macy was contributed for 19.9% of asthma costs of children in United States of America (15).

This study was done in Milad Hospital as an important referral center and findings can demonstrated a scheme of economic costs of asthma in Iran that will lead to make more premium decisions for asthma control programs.

In this study, we found the annual average cost of asthma for an asthmatic patient around 590 USD. According to Urban and Rural Household Income and Expenditure in 2010 that was surveyed by Iran Statistics Center, an Iranian common household expenditure was 99191330 Rials (9894.39 USD) and health expenditure was 7856003 Rials (783.64 USD) (16). According to our results asthma related costs included 75.5% of health expenditures of an Iranian household, it is clear that presence of an asthmatic patient in a family imposes high economic burden to family. We represented the direct costs to indirect costs 1.7 in this study. It is compatible with a systematic review in 2009 that showed direct costs were more than indirect costs (17).

Results of this study showed that asthma medication costs were the greatest part of patients' costs (55%) maybe relate to increasing usage of drugs in the therapeutic regimens in Iran. After drug transportation and work absence with 19% and 18% respectively had the most measures. Doctor visit, paraclinic (laboratory, radiography and spirometery) and emergency were the subsequent asthma expenditures. Comparing our results to other reports showed high concordance to other studies in Europe and America. Also they showed that pharmacy costs was the most expensive parts of direct costs as our study and work/school absence was the greatest proportion of indirect expenditures (17) that it is differ from our results, although most of our patients were in retirement age.

Results of our study showed that men significantly spend more than women for their asthma, a comparison between details showed that men's medication costs is significantly more than women (P=0.028). For finding the reason, we statistically analyzed the disease control status between two genders. Results showed significant increasing in partly controlled status of women and uncontrolled and completely controlled status did not show significant differences. For the explanation of high medication costs in men, we suggest this difference may be related to men's independent economical situation in compare with females that most of them have dependent economic situation in Iran also it may be related to Iranian women culture. However, it seems that it is a hypothesis for more sociological researches.

We found that total cost of uncontrolled asthma group was significantly higher than partly and completely controlled groups however, the difference between partly controlled and completely controlled was not significant. We found these data in agreement of other study that state "the economic burden of asthma disproportionately affects those with the most severe disease" (18). Inadequately controlled asthmatic patients are in high risk of morbidity and mortality, and they obviously have limited therapeutic regimens (19) and severe asthma patients bear great part of all asthma costs even though they are a small group of asthmatic population (20).

We did not find any association between asthma costs and smoking and comorbidities while in above-mentioned study the cost of asthma was correlated with comorbidities (17), also we did not find any relation between asthma cost and age groups.

Our findings showed that by deteriorating asthma control status the number of hospitalization days will increase markedly (P=008). However, there were not any relation between asthma control status and visit numbers (P=0.08) and number of emergency bed (P=0.075), this finding is comply with other studies that showed that asthma severity is strongly correlated with economic burden of asthma and increased recurrences of hospitalization (21-25).

Conclusion

Asthma affects a high economic burden to families and health system of Iran. According to the high proportion of asthma related cost compare to Total Income of an Iranian family, the necessity of public coverage of health assurance is quite

clear also we suggest that improving asthma management regimens can result in decreasing asthma medication costs as most important part of direct costs. Also improving accessibility to specialized treatment centers results in reducing costs of transportation as a major indirect asthma related cost.

For the better access to the annual information collection of patients and to increase the accuracy of results, we propose establishment of National Medical Expenditure Center in Iranian Ministry of Health that can provide easy access to financial information about the diseases.

Ethical considerations

Ethical issues (Including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc.) have been completely observed by the authors.

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