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Original Article

Asthma Burden in the Hospitalized Patients

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Abstract

Introduction

Asthma is a chronic inflammatory airway disease. Genetic and environmental factors have been important role in the induction of asthma. It's estimated that asthma affect 2.7 to 35.4% of children (in average 13.4%) in Iran. The aims of this study to assess the costs of asthma patients admitted in Boali Hospital in the North of Iran, Sari.

Materials and Methods

This descriptive study was carried out in asthma patients one to twenty years old that were admitted in the Boali Hospital in Sari, from 2008 to 2012. Out of 455 folders, 22 folders excluded, because they were incomplete registrations.

Results

Out of 432 patients, 280 patients (64.81%) were male. 349 patients were 1-5 years old (80.78%). Average annual cost in our asthmatic patients was 1,219,064 Rials (Iran currency) ($ 121.9) per patient; 1.183.655 Rials ($ 118.3) for men and 1.284.789 Rials ($ 128.5) for female patient respectively.

Conclusions

Our study showed asthma disease has been significantly cost for patient, family and country.

***Key words**:* Asthma, Burden, Iran, Hospitalization, Sari.

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Introduction

Asthma is a chronic inflammatory respiratory disease affect all of ages predominantly in children (1). More than 300 million people in the world currently have asthma. With increasing of asthma prevalence from several decades ago, it is estimated that more than 100 million people involved by asthma in 2025. It has a high economic burden on patients, their family, and society and healthcare resources in different countries (1-3). More common clinical manifestations including cough, wheezing, and dyspnea due to airway bronchospasm, intraluminal secretion and hypertrophy with hyperplasia of epithelial cells and muscles. Asthma had significant morbidity and mortality all over the world (4-6). Although, exact etiology of disease is not known, but genetic and environmental factors have been included in the induction of disease (6-9). In addition, a series of household allergens such as mites can cause asthma attack in susceptible individuals. Also, drugs such as Aspirin, Indomethacin and other non steroidal anti-inflammatory drugs can cause expression of asthma in susceptible individuals (9,10). Is estimated that the disease affect 10-17% children, which in turn are created the high economic burden for society, especially in industrial societies (1, 2). About 1% of the budget of a country like America should be spent on treating asthmatic patients (11).

Total average annual costs per asthmatic patients have variation in different countries according to the assessment of patients, the healthcare system, indirect costs and treatment of asthma (3, 7, 8). For example, the cost of annual treatment of asthma in America per patient is 640 dollars and in Sweden is 1315 dollars (11). Also the annual direct cost of asthma in Malaysia has been reported $ 108 and in Hong Kong is $ 1010 (12).

There has been obvious increase in the global prevalence, morbidity and mortality and even economic burden of asthma since the 1960s that specially in children was sharper than adult population (13). In the Middle East region about 20 million children suffer from this disease. Although asthma is more common in developed countries, its prevalence is becoming increasingly common in underdeveloped countries. It seems that main reason is increased urbanization in these countries (14).

Knowledge about burden of asthma is needed for health planner for making specific plans for prevention and treatment. The aim of this study was to estimate of different cost of asthmatic patients admitted in a general university educational hospital in capital of Mazandaran provenance in the North of Iran from 2006 to 2010.

Materials and methods

This descriptive study was carried out in asthmatic patients with 1 to 20 years old ages admitted in the children wards in Boali Hospital in Sari (the capital of Mazandaran Province) in the North of Iran, from 2008 to 2012. Out of 455 patient's folders, 22 folders excluded because they had been incomplete data. At last, 432 folders were evaluated**.** We evaluate demographic data such as age, sex and other data including; number of hospitalization days, family history of asthma, a history of allergies or chronic medical illnesses, previous history of hospitalization due to asthma, a history of drug use, history of admission in Pediatric intensive care unit (PICU), hospitalizations and medical costs nursing and emergency services. Data recorded in the computer and were analyzed by SPSS (version 13) software. We analyzed our data with t-test and ANOVA statistical assay with significant validate when cumulative incidence (CI) was less than 0.05%.

Results

Out of the 432 asthmatic patients admitted in the hospital, 280 cases were male (64.81%) and 152 cases were female (35.18%). The most patients in our study were between 1-5 years old ages (80.78%). Also 6-10 and 11-20 years old were 76 patients (17.59%) and 7 patients (1.61%) respectively (Table.1)

Table1: Distribution of age in our asthmatic patients admitted

Age (years old)	Number	Percent
1-5	349	80,78
6-1-	76	17,59
11-15	6	1,38
16-20	1	0.23
Missing (exclude data)	23	5
Total	432	100
Male	280	64,81
Female	152	35,18

133 patients (30.78%) had two days admission with future states; three days (22.45%), one day (16.20%) and four days (14.81%) respectively (Table.2)

Table 2: Distribution of duration of day`s admission in asthmatic patients

Days	Number	Percent
1	70	16,20
2	133	30,78
3	97	22,45
4	64	14,81
5	27	6,25
6	16	3,70
>6	25	5,78
Total	432	100

153 patients (35.41%) had previous history of hospitalization in general ward of hospital cause asthma attack but 279 patients (60.4%) didn't. On the other hand these patients admitted first time in the hospital for asthma attack. 26 asthmatic patients (6.94%), admitted in the PICU because of severe asthma and 109 patients (25.23%) had a family history of asthma. 79 patients (18.28%) were mentioned history of other medical illness (Table.3).

Table3: Distribution of previous history of admission, PICU admission, family history of allergic disorders, personal history of other diseases inour asthmatic patients

Previous history of admission	Number	Percent
Yes	153	35.41
No	279	64.58
Total	432	100
PICU admission		
Yes	30	6.94
No	402	93.05
Total	432	100
Family history of allergic disorders		
Yes	109	25.23
No	323	74.76
Total	432	100
Combined other disorders		
Yes	79	18.28
No	353	81.71
Total	432	100

In our study more patients took 4 drugs (32.17%) and the less common incidence includes; 3 drugs (28.24%), five drugs (18.51%) and 2 drugs (9.49%) (Table. 4).

Table 4: distribution of drug number application in our asthmatic patients

Drug (number)	Number of patients used	Percent
1	3	0.69
2	41	9.49
3	122	28.24
4	139	32.17
5	80	18.51
6	32	7.40
>6	15	3.47
Total	432	100

The average of cost for 1-5, 6-10 and 11-15 years old ages were: 1273 020, 1004236 and 1080483 Rials respectively. In this study, the overall mean cost of medical insurance and hospital were respectively: 518437($ 17.5) and 7050627 Rials ($ 25) Rials , additively equals 1219064 Rials. In male patients were 533240($ 17.8) and 650,415($ 25) Rials respectively and in female patients 533774($ 17) and 751015 ($ 25) Rials respectively. The average cost per patient for the nursing for medical insurance and hospital was 101,480 ($ 3) and 85,986($ 2.2) Rials respectively (Table.5).We explained that each 10000 Rials equals $1 (2008 to 2012).

Table 5: distribution of mean cost based on drug, x-ray, laboratory, physician, consultants and nursery in our asthmatic patients

Objects	Mean cost
Drugs	242030 R ($ 24.2)
X-ray	61012 R ($ 6.1)
Laboratory tests	49669 R ($ 2.9)
Physician	528280 R ($ 52.8)
Consultants	244339 R ($ 24.4)
Nursing	93734 R ($ 9.3)
Total	1219064 R ($ 121.9)
Male	1183655 R ($ 118.3)
Female	1284789 R ($ 128.4)

Discussion

Asthma burden is a serious concern for patient, family and government or private health managers because asthma is the most common chronic disorders in children. Asthma burden is different and including morbidity, mortality and impaired of quality of life (direct and indirect costs). The prevalence of asthma is different in the world. The pooled prevalence of asthma in male, female and both is 4.3% [Cumulative incidence(CI); 3.5 to 5.1%], 3.2% (CI; 2.5 to 3.9%), and 3.9% (CI; 3.2 to 4.7%), respectively in Iran (15). Totally prevalence of asthma in Iranian children estimated as 13.14% (95% CI: 9.97-16.30%) (16). In our study in this region showed 12% prevalence of asthma in elementary schools (17,18). Therefore, several millions of children in our country have asthma. The asthma healthcare cost is 1-2% total healthcare costs in developed countries (19). In Asia the prevalence of asthma is 1.5% in Nepal and 6.2% in Hong Kong (20).

Our patients were under 5 years old ages (77%), therefore, younger children were more predispose to get asthma attach and admission. Male patients were more common (65%) then they have a more predispose to get asthma attach and more admission. The similar other study showed asthma prevalence is more common in male gender than female gender (1.5 to 2 times) (21). In China male to female ratio of asthma disease is 1.75:1(22) but in India the prevalence of asthma is in a range of 0.5 – 18 %(23).

The most of our patients had a short time (less than 2 days) admission. With prescribe good action plan to patients or care keepers could to take low admission rate and short duration of admission. Fortunately, the most of our cases had a short time stay in hospital. This is the similar study in Brazil that fifty percent of

patients remain in hospital for less than 2 days (24).

150 cases of our patients had previous history of admission (33%), it is important that more patients with asthma don`t have previous admission. Mild asthma could be at risk of attacks because, they use intermittent drug, only short acting beta agonist and even the stop drugs. Also, under diagnosis and family denied of asthma could be other reasons.

6.1% of our patients had history of admission in PICU. Although this is low incidence but it has higher cost compare to patient that admitted in general ward. Also, these patients have more morbidity and mortality. In Brazil study showed PICU admission of asthma attacks was 7.3% of all admissions (25).

Family history allergic diseases including asthma, allergic rhinitis, atopic dermatitis and urticarial vasculitis was positive in 24 percentage (n=108) of our patients. Then, often of patients did not have family history and this is not necessary for diagnosis of asthma. 76 of our patients had other disorders such as sinusitis, allergic rhinitis that induce increases cost.

More common of patients in our study received 3 or 4 drugs that they have more financial burden. The top 4 drugs used in our study were ventolin (short acting beta agonist), Hydrocortisone, Atrovent and nasal washing with sodium chloride.

Current guidelines are important because doing it could be useless more drugs and induce decrease cost. Available a good emergency department with enough equipment could be treat asthma attacks and this reduced future admission. Air pollution one the important risk factor for induces attack asthma then government managers need to reduce air pollution and make a clear air.

Our study showed that physician fee (428280 Rials, $ 42.82), drug cost (242186 Rials, $ 24.21) and consultants (214339 Rials, $ 21.43) were containing more cost. The cost of nursing, x-ray and laboratory tests were less common. Physician fee, consultants and nursing costs was not significant differences between two genders but drug fee was more common in male gender. Laboratory and x-ray costs were more common in female group.

Total average cost of admission for a female and male patients were 1284789 and 1183655 Rials respectively. Average cost In Australian family for a child with asthma was $212.48. in this country the mean cost for hospitalized asthmatic patients was $884.34 annually (26).

In comparison, adult asthma has a high impact burden on direct and indirect cost such as low reproducibility, abstinent at work, loss of job. Annually cost of adult asthma was 1907 dollars (2008 dollars) in USA (27).

The average cost was more expensive in 1-5 years old cause to laboratory, consultants and admission costs and there is significant difference between less than 5 years old and older ages. The similar results were seen in other study (28). And in Brazil the highest rates are recorded in children under 5 years of age (15% of all admissions) (29).

In verse, in Peru mainly asthmatic children are aged 5–9 years (30).

Between two groups with previous admission history or not, we showed that average cost in previous admission group was 1155723 Rials, ($115.55) but in other group was 1248740 Rials ($124.87). Therefore, previous history due to more knowledge, early diagnosis and early intervention with appropriate treatment cause less cost.

Only 26 cases of our study were in PICU but the average cost was more expensive (2 times) than general wards, 2510962 ($251) and 1146175 Rials ($114.61) respectively. Therefore, increase knowledge, early diagnosis, early treatment could decrease admission especially PICU admission. In other study

showed that uncontrolled or partially controlled asthma had more cost with 50% indirect cost (31).

Family history of allergic disorders was positive in 106 patients showed atopic base. Cost in positive and negative family history of allergic disorders was 1265430 Rials ($126.54) and 1199472 Rials ($119.9) respectively. At results, it seems that atopic condition cause more expensive cost although there is not significant differences between two groups.

76 patients has other diseases such as rhinitis, sinusitis, otitis and Gastroesophageal *reflux* disease (GERD) with average cost 1462004 Rials ($146) in contrast other group without other disease with 1163715 Rials ($116.3). Added disorder due to addition drugs and slowly response to asthmatic drugs cause longer stay in hospital and more cost ($P<0.05$).

The average cost each patient in our study was 120 dollars but in other study the annual costs of treatment of hospitalization of asthma patients was $ 790 (6). In New Zealand country, annual cost for asthmatic patient is high (US$ 2584) compared US$ 410 for others (32). However, in India, the cost of treatment of an asthmatic patient was US$ 30 per month (33).

Our study showed severe asthma(PICU patients) has more cost than less severe form, this is similar other studies that the cost of treatment based on disease severity is as follows: Annual treatment costs are about $ 1,336 in mild asthma, $ 2,407 in moderate asthma and$ 6,393 in severe forms. This is important point that in all levels of severity; indirect costs were twice as high as direct costs.

Also at all severity, total direct annual costs in females were higher more than males. This is similar our study that showed more direct cost of female admission than male admission. Unfortunately, we could not estimate indirect burden of our patients.

Therefore, many of mild and moderate asthmatic patients could be treated by primary care physicians according to current guidelines then we could reduce cost of these patients.

The annual treatment cost of asthma in European countries is high. For example annual burden of asthma in France approximately estimated to be 1.5 billion euro and 2.7 billion euro in Germany (34). Total annual cost has been found to be more than 2.5 fold higher in uncontrolled or without access to healthcare in asthmatic patients (35,36). Again mentioned, unfortunately, there is not any statistics of annual cost of asthmatic patients in Iran. Therefore, we could not compare between my country with other countries. Annual cost of asthma patients in Iran may be higher, lower or equally than other countries.

Limitations of our study are

Firstly our study carried out on asthma patients and reliability of our study was based on recorded data on these folders, this is a retrospective study. Probability there is some under diagnosis or over diagnosis. Secondly we didn't reach the indirect cost of asthma because we evaluate folders of patients that didn't include the indirect costs. At last, we could not evaluate other costs includes; physician visits and drugs cost (outpatient cares).

Nevertheless with these limitations, with high prevalence of asthma in Iran, we need to education to patients (including; action plan, use of spacer for the Metered-dose inhaler (MDI) sprays, use of oral steroid, need short acting beta agonist), physicians especially primary care keepers to controls and suitable treatment of asthma to prevent high economic burden, morbidity and mortality especially in severe cases.

Annual training program such as asthma congress or seminar in world asthma day for all health workers (physicians, nurses, family) could be effective for increase

knowledge of this disease and then decrease attacks, admission and cost.
We suggest carry out more accurate studies in Iran for assessing the annual direct and indirect cost of asthma in children.

Conclusion

Annual cost of asthmatic patients is different for a patient and for a country with other country. This is depended to local drug price, severity of asthma, buy drugs from other countries and prevalence of asthma. The prevalence of asthma among children based on diagnostic and differences in race and residency area is different from 4.4% in Asia to 13% of United States (13, 14). Average prevalence of asthma is 13.14% in Iran which is median in the world.

Asthma education in association with anti-inflammatory treatment has led to decreased asthma morbidity and reduced asthma-related costs (36).

Conflict of interest

The author have no conflicts of interest.

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