

# The Cost of Asthma in Kuwait

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## Key Words

Asthma · Cost · Gulf · Kuwait · Delphi method

## Abstract

**Objective:** To evaluate the direct costs of treating asthma in Kuwait. **Materials and Methods:** Population figures were obtained from the 2005 census and projected to 2008. Treatment profiles were obtained from the Asthma Insights and Reality for the Gulf and Near East (AIRGNE) study. Asthma prevalence and unit cost estimates were based on results from a Delphi technique. These estimates were applied to the total Kuwaiti population aged 5 years and over to obtain the number of people diagnosed with asthma. The estimates from the Delphi exercise and the AIRGNE results were used to determine the number of asthma patients managed in government facilities. Direct drug costs were provided by the Ministry of Health. Treatment costs (Kuwaiti dinars, KD) were also calculated using the Delphi exercise and the AIRGNE data. **Results:** The prevalence of asthma was estimated to be 15% of adults and 18% of children (93,923 adults; 70,158 children). Of these, 84,530 (90%) adults and 58,932 (84.0%) children were estimated to be using government healthcare facilities. Inpatient visits accounted for the largest portion of total direct costs (43%), followed by emergency room visits (29%), outpatient visits (21%) and medications (7%). The annual cost of treatment, excluding medications, was KD 29,946,776 (USD 107,076,063) for adults and KD 24,295,439 (USD 86,869,450) for children. Including medications, the total annual direct cost of asthma treatment was

estimated to be over KD 58 million (USD 207 million). **Conclusions:** Asthma costs Kuwait a huge sum of money, though the estimates were conservative because only Kuwaiti nationals were included. Given the high medical expenditures associated with emergency room and inpatient visits, relative to lower medication costs, efforts should be focused on improving asthma control rather than reducing expenditure on procurement of medication. Copyright © 2012 S. Karger AG, Basel

## Introduction

The World Health Organization estimates that 235 million people suffer from asthma worldwide (2011) [1]. Asthma is characterized by shortness of breath, chest tightness, wheezing and coughing (NIH National Heart Lung and Blood Institute) [2]. It is the most common chronic illness among children [1]. In the Phase III International Study of Asthma and Allergies in Children [3], 13.8% of 13- and 14-year-old schoolchildren worldwide reported that they have had asthma at some time in their lives. The study by Owayed et al. [4] also reported that 15.6% of 13- and 14-year-old schoolchildren in Kuwait were diagnosed with asthma. Another study by Abal et al. [5] found that 22% of Kuwaiti 5- to 7-year-old children suffered from asthma.

Given the prevalence of the disease and its symptoms, asthma imposes a considerable economic burden on healthcare systems. One study by Kamble and Bharmal

[6] found that the annual direct medical expenditure for asthma treatment in the US in 2007 was USD 37.2 billion. In Europe, the annual direct cost of asthma is estimated to be EUR 7.9 billion [7]. Furthermore, another study in the US found that the total incremental cost of asthma to society, also including indirect costs, was USD 56 billion in 2007 [8].

Estimation of the national expenditures for asthma treatment can provide useful information to guide clinicians and policymakers to better manage asthma through improved treatments. To our knowledge, the literature is lacking in studies that estimate the costs of asthma treatment in Kuwait. This study aimed to evaluate the direct costs of treating asthma in Kuwait, specifically focusing on Kuwaiti nationals treated in government healthcare facilities in Kuwait. These include costs of outpatient treatment, hospital emergency visits, inpatient treatment, medicines and total direct costs of treatment for asthma.

## Materials and Methods

### Data Sources

Population figures were obtained from the 2005 census data from the Kuwaiti Ministry of Planning, and projected to 2008 [9]. Drug usage and cost were provided by the Ministry of Health Purchasing Department (MOH Purchasing Department, 2009–2010). Typical treatment profiles including emergency visits, outpatient visits, inpatient stays and use of pharmacological treatment were obtained from the Asthma Insights and Reality for the Gulf and Near East (AIRGNE) study [10].

Due to a lack of published data on asthma prevalence and unit costs of asthma treatment, a modified Delphi technique was used to gather consensus estimates of these data. One of the main advantages of using the Delphi technique is its ability to obtain expert knowledge from each participant without influence from other participants as opposed to a face-to-face group panel approach [11].

The Delphi panel methodology consisted of consensus consultations with nine leading physicians in asthma treatment in Kuwait. Two rounds of data collection from the panel were conducted to determine these estimates. In round 1, a summary of the best currently available data on asthma prevalence and unit costs of asthma treatment were provided to each of the panel members. Treatment costs included outpatient, emergency room (ER) visit, and inpatient costs for both adults and children. Each panel member provided his/her own expert estimates individually, including upper and lower estimates in addition to a 'best' estimate. An average of the round 1 combined estimates from the panel members was calculated for each data input, and then used in round 2.

During round 2, the panelists were given these mean values to consider, and were given the opportunity to amend their round 1 estimates where they thought it was appropriate to do so. These revised estimates for prevalence and costs (for both adults and children) generated in this second round were used in the main calculations of the current study.

### Cost Analysis

To estimate the number of patients treated in government facilities, the asthma prevalence determined in round 2 of the Delphi exercise was applied to the total Kuwaiti population aged 5 years and over to obtain the number of individuals (both adults and children) diagnosed with asthma in Kuwait. Individuals aged 5–15 were categorized as children and those aged 16 years or older were categorized as adults. Estimates from round 2 were then multiplied by the percentage of patients using government facilities as reported in the AIRGNE study to determine the total number of asthma patients managed in government healthcare facilities [10].

To estimate the total outpatient treatment cost, the total number of asthma patients treated in government healthcare facilities was multiplied by the average number of outpatient visits per year as reported in the AIRGNE study to determine the total number of outpatient visits per year [10], which was then multiplied by the unit cost of an outpatient visit, as determined in round 2 of the Delphi panel exercise. Figures were estimated for both adults and children.

To estimate ER visit and total inpatient treatment cost, the percentage of asthma sufferers visiting an ER, as reported in the AIRGNE study [10], was multiplied by the total number of asthma patients treated in government healthcare facilities. The result was then multiplied by the average number of ER visits per year (also reported in the AIRGNE study) to obtain the total number of ER visits per year. The unit cost of an ER visit, determined in round 2 of the Delphi exercise, was used to obtain the total cost of ER visits. Costs were estimated for both adults and children.

The total inpatient treatment cost estimate was calculated in a similar manner using estimates from round 2 of the Delphi exercise.

To estimate total direct treatment cost, it was assumed that total direct costs for adults and children were the sum of outpatient costs, inpatient costs, ER visit costs, and the costs of asthma medications which were all obtained from the Ministry of Health Purchasing Department.

### Sensitivity Analysis

A sensitivity analysis to the results from the Delphi panel was conducted based on the lowest 50% of values collected in round 1.

## Results

The best estimates of asthma prevalence in Kuwait obtained from the Delphi panel were 15% of adults and 18% of children, which corresponds to a total number of 93,923 adults and 70,158 children, respectively. Of these, 84,530 (90%) adults and 58,932 (84%) children were estimated to be using government healthcare facilities (table 1).

Inpatient visits accounted for the largest portion (43%) of total direct costs for asthma treatment (fig. 1). The total number of nights that adult asthma patients spent in hospital per year was estimated to be 98,689, incurring a total cost of Kuwaiti dinars (KD) 12,888,813 (USD 46,087,161). The corresponding numbers for children were estimated

**Table 1.** Estimated number of Kuwaiti nationals suffering from asthma using Ministry of Health facilities

	Adults ( $\geq 16$ years)	Children (5 to $<16$ years)
Population in 2008	626,151	389,765
Asthma prevalence	93,923 (15%)	70,158 (18%)
Total asthma sufferers using government facilities	84,530 (90%)	58,932 (84%)

**Table 2.** Estimated total cost of inpatient treatments of asthma for Kuwaiti nationals

	Adults ( $\geq 16$ years)	Children (5 to $<16$ years)
Total number of sufferers using government facilities	84,530	58,932
Asthma sufferers hospitalized per year	21,133 (25%)	21,216 (36%)
Average nights hospitalized per year	4.67	5.13
Total number of nights hospitalized per year	98,689	108,836
Unit cost of an inpatient day/night	KD 130.6 (USD 466.99)	KD 112.8 (USD 403.34)
Cost of inpatient visits	KD 12,888,813 (USD 46,087,161)	KD 12,276,755 (USD 43,898,595)

**Table 3.** Estimated total cost of ER visits by Kuwaiti nationals due to asthma

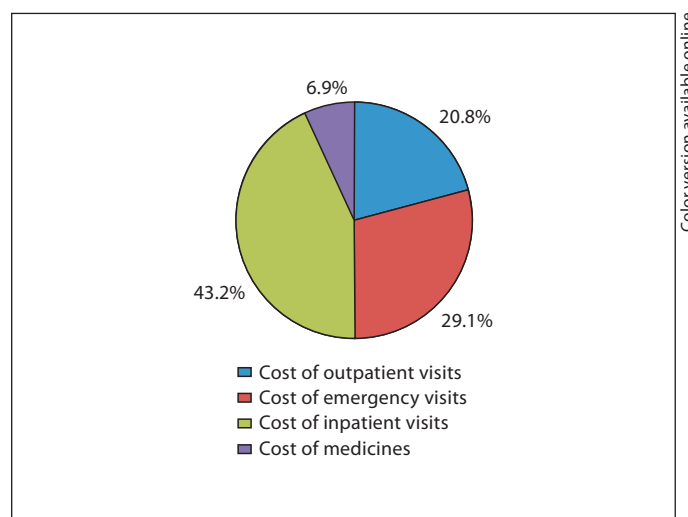
	Adults ( $\geq 16$ years)	Children (5 to $<16$ years)
Total number of sufferers using government facilities	84,530	58,932
Asthma sufferers needing ER visits per year	75,232 (89%)	52,450 (89%)
Average number of ER visits per year	2.38	2.46
Total number of ER visits per year	179,052	129,027
Unit cost of an ER visit	KD 55.1 (USD 197)	KD 55.1 (USD 197)
Cost of ER visits	KD 9,865,780 (USD 35,277,553)	KD 7,109,374 (USD 25,421,337)

to be 108,836 nights, at a total cost of KD 12,276,755 (USD 43,898,595) (table 2).

The second largest component of total direct costs was the cost of emergency visits at 29% (fig. 1). The total number of ER visits per year for adults with asthma was 179,052 at a total cost of KD 9,865,780 (USD 35,277,553). For children, the total number of ER visits per year was 129,027 at a total cost of KD 7,109,374 (USD 25,421,337) (table 3).

There were 202,028 outpatient visits per year estimated for adults with asthma and 137,902 for children. The total cost of outpatient visits for adults was KD 7,192,183 (USD 25,717,441) and for children, KD 4,909,310 (USD 17,554,460), making up 21% (fig. 1) of the total cost of asthma treatment (table 4).

The overall cost of asthma treatment is shown in table 5. The subtotal (before including the cost of medi-

**Fig. 1.** Percentage of total direct cost of asthma treatment.

**Table 4.** Estimated total cost of outpatient visits by Kuwaiti nationals

	Adults (≥16 years)	Children (5 to <16 years)
Total number of asthma patients using government facilities	84,530	58,932
Average number of outpatient visits per year	2.39	2.34
Total number of outpatient visits per year	202,028	137,902
Unit cost of an outpatient visit	KD 35.6 (USD 127.3)	KD 35.6 (USD 127.3)
Total cost of outpatient visits	KD 7,192,183 (USD 25,717,441)	KD 4,909,310 (USD 17,554,460)

**Table 5.** Estimated total direct cost of asthma treatment in Kuwait

Total treatment costs	Adults (≥16 years)	Children (5 to <16 years)	Total
Cost of outpatient visits	KD 7,192,183 (USD 25,717,441)	KD 4,909,310 (USD 17,554,460)	KD 12,101,494 (USD 43,271,906)
Cost of emergency visits	KD 9,865,780 (USD 35,277,553)	KD 7,109,374 (USD 25,421,337)	KD 16,975,153 (USD 60,698,887)
Cost of inpatient visits	KD 12,888,813 (USD 46,078,161)	KD 12,276,755 (USD 43,898,595)	KD 25,165,568 (USD 89,985,756)
Subtotals	KD 29,946,776 (USD 107,082,157)	KD 24,295,439 (USD 86,874,393)	KD 54,242,215 (USD 193,956,550)
Cost of medicines			KD 3,995,810 (USD 14,288,013)
Total direct cost of treatment			KD 58,238,025 (USD 208,244,564)

cines) cost of treatment visits for adults was KD 29,946,776 and 24,295,439 (USD 107,082,157 and 86,874,393) for children. Added together with the cost of medicine, total direct cost of asthma treatment was over KD 58 (USD 207) million.

The proportions of the total direct costs of asthma treatment are shown in figure 1. Approximately 72% of direct costs were related to inpatient and ER treatment. Compared to these costs, the cost of medications was relatively small at 7% of total direct costs.

#### *Sensitivity Analysis*

Although the costs changed when using the lowest 50% of values collected in round 1 of the Delphi exercise, the inpatient and ER treatment costs still made up the largest portion of the total direct costs, while the cost of medications was substantially lower.

#### **Discussion**

Asthma treatment caused a substantial financial burden on healthcare; the estimated direct cost of asthma treatment was KD 58 million (USD 207 million). This cost was primarily driven by inpatient stays and ER visits which made up approximately 72% of direct costs. Compared to these costs, the cost of medications was relative-

ly small at 7% of total direct costs. It should be noted that these estimates comprised only the costs incurred by Kuwaiti nationals at government healthcare facilities, and did not include the private sector or the treatment of expatriates. Given that Kuwaiti nationals make up only 32% of the population in Kuwait, the total cost of treating asthma in all healthcare facilities in Kuwait would clearly be much higher.

This high proportion of cost is further emphasized when noting that the number of ER visits and hospitalizations for asthma patients in Kuwait are considerably higher compared to Europe. The AIRGNE study reported that 89% of adults and children with asthma in Kuwait have visited an ER in the year preceding the study [10]. In contrast, as reported in the AIRE study by Rabe et al. [12] only 10% of asthma sufferers in Europe reported visiting an ER in the year preceding the study. In addition, the AIRE study found that only 7% of sufferers required overnight hospitalization in Europe during the previous 12 months compared to 27.4%, as reported by the AIRGNE study [10, 12]. Inpatient stays and ER visit treatments are both correlated with a lower level of asthma control, leading to a potentially larger cost burden to the Ministry of Health.

In contrast to the distribution of costs in Kuwait described in figure 1, in Europe, annual direct costs were 48% (20.8% in Kuwait) for outpatient care, 46% (6.9% in

Kuwait) for drug costs and 6% (43.2% in Kuwait) for inpatient care [7]. In the US, it was reported that prescription medications and physician office visits accounted for the largest share of total expenditures and comprised approximately 38% of the total incremental expenditures for asthma in children and approximately 49% among adults [6]. Compared to US, the higher proportion of expenditure for outpatient visits, inpatient stays and ER visits for asthma in Kuwait could reflect the poor level of disease control in Kuwait compared to the US. There are caveats to this analysis. Asthma prevalence and unit cost estimates were based on results from an expert panel using the Delphi technique. Although the use of two rounds enhanced the reliability of the estimates, the results were still dependent on the individual opinions of the panel members, which is a subjective estimation of costs and prevalence.

In addition, the AIRGNE study, which reported some values used in this study, only involved Kuwaiti nationals [10]. At approximately 32%, Kuwaiti nationals make up one third of the total population [9]. Therefore the total cost incurred by the Ministry of Health to treat asthma could be much higher than the estimates produced by this study, since non-Kuwaitis were not included in the estimate of prevalence of asthma in Kuwait. Further-

more, this study only measured direct costs. The inclusion of other costs, such as nondirect medical costs, indirect costs (days lost from work, school, etc.) and intangibles (quality of life, societal contribution, etc.) is likely to result in an even greater total cost burden of asthma from a societal perspective.

## Conclusion

Asthma costs Kuwait a huge sum of money, though the estimates were conservative because only Kuwaiti nationals were included. Given the high medical expenditure associated with ER and inpatient visits, relative to lower medication costs, efforts should be focused on improving asthma control relative to reducing expenditure on procurement of medication.

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