

EMERGING STATUS OF ASTHMA, ALLERGIC RHINITIS AND ECZEMA IN THE MIDDLE EAST

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AUTHORS' CONTRIBUTIONS

This work was carried out in collaboration between all authors. Author SMH as the first author (corresponding author) has had the main idea in the developing, analyzing as well as writing review. Author AA contributed literature search and addition of prevalence data. Author SH contributed in the discussion and review of the manuscript and author AAF also contributed in the discussion and adding to the review. All authors read and approved the final manuscript.

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ABSTRACT

Allergic diseases such as bronchial asthma, allergic rhinitis, rhino-conjunctivitis and eczema appear to be very common in and around the Middle East region. These diseases are known to be on the rise in the world, and likewise, there are reports that such diseases are increasing in the region as well. However, studies conducted on the prevalence of such diseases in the region appear to differ in their format except in Saudi Arabia and where conducted as part of International Studies of Allergy and Asthma in Children (ISAAC). The data from different countries, summarized in this communication, were conducted at different time intervals. Therefore this review article attempts to highlight and compare the available data on the prevalence of such diseases in the Gulf region (KSA, UAE, Qatar, Kuwait, Bahrain and Oman) and some neighboring countries (Turkey, Egypt, Jordan, Iran, Iraq, Lebanon, Morocco and Pakistan). The data were obtained from published studies only. A limited or no data were available for some countries in the region.

The review shows a prevalence of allergic diseases in children in the region. The overall percentage of asthma in the region ranged between 10-30% with the highest occurrence in Saudi Arabia (23%). Allergic rhinitis and eczema were the most dominant in Morocco and Qatar and were found to be affecting 38% and 23% of the population respectively.

The multi-factorial causes of such diseases including impact of dominating etiological factors in both indoor and outdoor environment still remain subject of investigation in most countries of the region.

It is suggested that a joint GCC study using some kind of standardized protocol covering school children age 6 to 16 years, will not only benefit the patients but by adopting prevention, control and screening strategies, billions of dollars can be saved in the coming years.

Keywords: Asthma; allergy; economic cost; prevalence; Middle-East.

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1. INTRODUCTION

Allergies are antigen-antibody reactions. Antigens are allergens, defined as environmental agents that induce IgE-mediated immediate hypersensitivity reactions following inhalation, ingestion or injection. Some genetically predisposed individuals inherit the tendency for allergies from their parents and get mono- or poly-sensitized by inhalants.

The most common symptoms of respiratory allergic reaction include: bronchial asthma, rhinitis, sneezing, accompanied by runny or clogged nose, coughing, itchy eyes, nose and throat.

Exposure to allergens contributes to exacerbation of allergic asthma and persistence of symptoms [1]. In fact, asthma is a heterogeneous lung disorder characterized by airway obstruction, inflammation and eosinophil infiltration into the lung [2]. Asthma, which typically begins in childhood and is the most common chronic disease of childhood, has reached epidemic proportions [3]. It is considered to be one of the most important causes of morbidity in childhood [4]. The symptoms of asthma include coughing, wheezing and tightness in chest that leads to shortness of breath [5].

Allergens are divided into two categories; outdoor and indoor allergens. The outdoor allergens include pollen, fungal spores, dust particles and non-specific irritants, etc. whereas the indoor allergens include House Dust Mites (HDM), animal allergens, moulds and fungi, insect allergens, rodent allergens, etc. However, according to the study of Salo PM et al. [1] the indoor allergens are considered an important risk factor for asthma.

1.1 Prevalence of Allergic Diseases

Allergic diseases like bronchial asthma, allergic rhinitis, eczema, allergic rhino-conjunctivitis are the most common form of disorders in young children. For instance, the frequency of asthma decreased in most of the studied children with increasing age [6]. The overall prevalence of allergic disorders in children has been reported to be as high as 41% in western countries, with bronchial asthma having been shown to be a leading cause of morbidity and mortality among these allergic disorders [7]. In fact, studies have suggested that the asthma prevalence is generally lower in the Middle East than in more developed countries [8]. Despite the recent advances in our understanding of the pathogenesis of asthma and improved treatment for this important disease, the prevalence of asthma is increasing [7]. There have been several studies carried out in the Middle East region on the prevalence of allergic diseases in

individuals of different age groups and at different periods of time. While some countries followed the standard protocol developed by the International Studies for Allergy and Asthma in Children referred as ISAAC, some of the countries used different protocols to evaluate the results of Skin Prick Testing (SPT). There was no standard protocol applied in any of the studies.

The studies conducted in various countries suggest that a good number of people, particularly children, are suffering from allergic diseases, e.g. bronchial asthma, allergic rhinitis, etc. The causes of the worldwide increases in the allergic diseases and asthma in children are related to different factors. In addition to the indoor and outdoor allergens, several other features influence in increasing the risk of respiratory and asthma symptoms. The dietary factors in childhood are one of the important influences in determining the expression of allergic reactions [9]. Another factor that can increase the risk of respiratory systems among asthmatic and non-asthmatic children is the parental smoking at home [10,11]. In fact, smoking in closed area affects severely the respiratory system, especially in children. In addition to the previous factors, temperature has a very close inverse correlation with the seasonal distribution of asthmatic attacks, while humidity has a direct correlation [12]. This means that the maximum rates of asthmatic reaction occur during the winter and the minimum values occur in summer. A high positive correlation also exists between the affected offspring and their relatives with respect to asthma and hay fever. In fact, a study was made in Saudi which shows that asthma and hay fever may be inherited in the population [13]. To sum up, atopic family history, food allergy, eczema and frequent otitis media and sinusitis attacks were found to be significant in asthma prevalence in children [14].

Some countries in the Middle East region used an international designed questionnaire for the prevalence of asthma, allergic rhinitis and eczema, and started their studies earlier than the ISAAC. However, some countries followed the ISAAC program. The difference between the two studies is clear; the earlier include school age group children (6 to 16 years of age), while the ISAAC phases involves a certain age group (6-7 year olds and 13-14 year olds) [15].

As shown in the graph in Fig. 1, bronchial asthma is most prevalent in Saudi Arabia occurring at 23%. The study conducted by Al-Frayh et al. also indicates that there was a significant increase in the prevalence of bronchial asthma and, to a lesser extent, in the prevalence of allergic rhinitis in the Kingdom of Saudi Arabia during a 9-year period [4]. The study

also revealed increased exposure to environmental factors such as tobacco smoke and indoor animals in Saudi houses. It seems that the continuing changes in contemporary life may well have contributed to the increased prevalence of asthma in the country [16]. The data in this review shows that the prevalence of asthma in Iraq [17], Oman [18] and Qatar [19] stand at 22.3%, 20.7% and 19.8% respectively. In addition, another study by Al-Frayh et al. [20] revealed that the Kingdom of Saudi Arabia is one the country that has the highest prevalence of bronchial asthma in children. However, a recent study about the prevalence of asthma and associated symptoms in 16 to 18 year old adolescents in Saudi Arabia shows that it is high, but within the range of reported prevalence rates in various parts of the world [21]. The disease is also common in Kuwait [22], Pakistan [23], UAE [16], Iran [24], Egypt [25], Lebanon [26], Jordan [27] and Turkey [28]. No studies on bronchial asthma have been reported from Bahrain and Morocco yet.

Allergic Rhinitis is found to be most common in Morocco (37.8%), Lebanon (32.7%), and also in Qatar and Pakistan, with its occurrence of 30.5%, and 28.5% respectively (Fig. 2). As per the study in Morocco, rhinitis was evaluated using the ISAAC questionnaire. Prevalence of rhinitis was 37.8%. It was higher in those aged 15-49 years, illiterate subjects, active smokers, those presenting with overweight and those with hypereosinophilia. It was significantly lower in children < 10 years [29].

According to the study in Qatar, genetic factors related to the high rates of consanguinity may play an important role in the high prevalence rates noted in the Qatari population, but changes in lifestyle and environmental factors cannot be discounted as possible causes of the high prevalence noted in this

Qatar study [21]. Moreover, the diagram in Fig. 3 shows that asthma overlap with allergic rhinitis and eczema in Qatari patients. The study in Pakistan showed that there are a significant number of school children in the metropolitan city of Karachi who have various allergic symptoms. It also sheds light on the fact that exposure to indoor environmental factors as well as family atopy can play a key role in increasing the chances of an individual to experience asthma and other allergy symptoms [23]. Allergic Rhinitis is also prevalent in KSA, Kuwait, UAE and Iran [30], accounting to 20-25%, on an average. No data was available from Bahrain, Iraq, Egypt and Jordan.

In addition to the asthma and allergic rhinitis, eczema (Atopic Dermatitis) was most common in the population of Qatar (23%) and Pakistan (22%). However, no studies on the prevalence of eczema have been reported in UAE, Bahrain, Iraq, Egypt, Jordan and Morocco (Fig. 4).

1.2 Economic Cost

In addition to the health impact of asthma, there are also economic costs associated with it. These include costs related to hospital expenditure, loss of school and work time, leading to a poor productivity and disease related morbidity and premature mortality. Globally, the economic costs associated with asthma and other related allergic diseases are increasing day after day. It is estimated that, globally, as many as 300 million people of all ages and all ethnic backgrounds suffer from asthma, with 180,000 deaths annually and all the burden of this disease to governments, healthcare systems, families and patients in increasing [31]. Numerous studies have been published evaluating the economic burden of asthma on society and individuals.

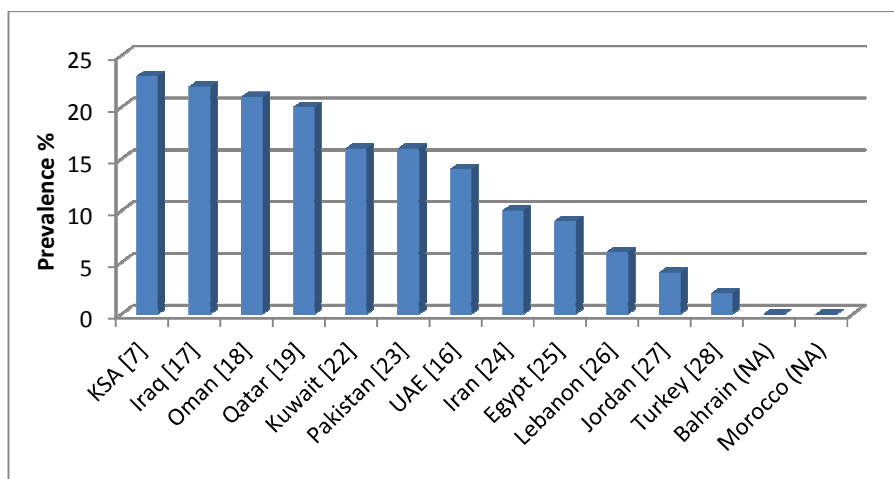


Fig. 1. Prevalence of asthma in Middle East and neighboring countries

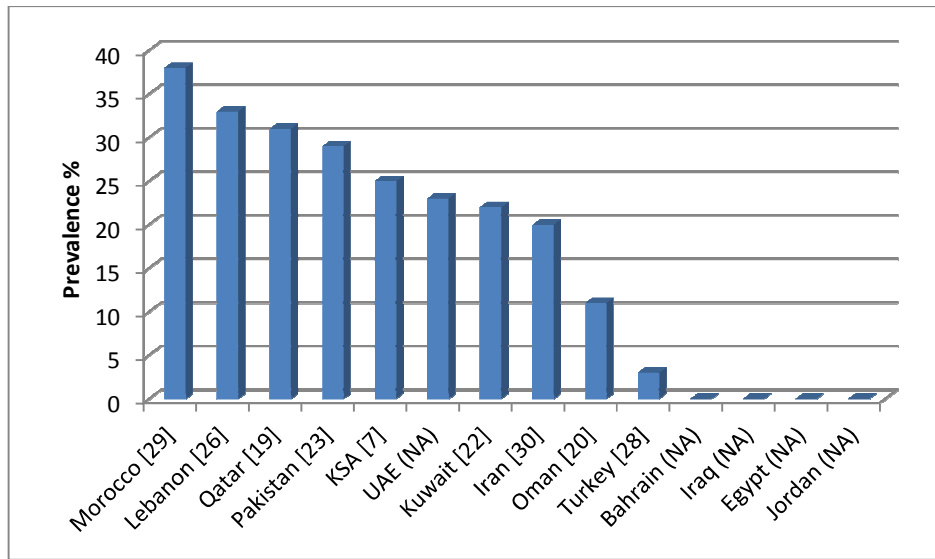


Fig. 2. Prevalence of allergic rhinitis in Middle East and neighboring countries

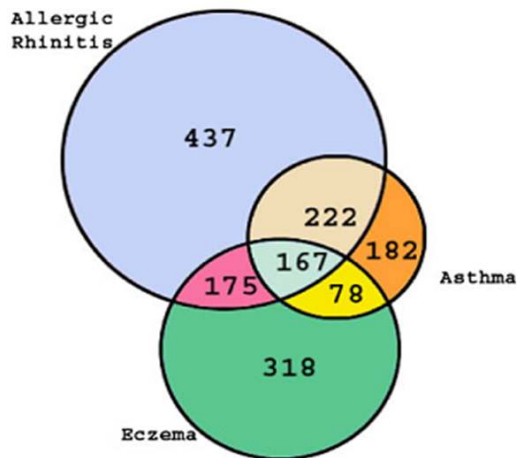


Fig. 3. Venn diagram showing overlap of asthma with allergic rhinitis and eczema (n=3,283) in Qatari Patients. The numerical values indicate the total number of subjects. (Adapted from Janahi et al. [19])

Table 1. Economic cost of allergies and asthma in children in Saudi Arabia (estimated) (Hasnain SM, personal communication, 2012)

Prevalence of bronchial asthma	> 15-20%
Prevalence of allergic diseases	> 20-25%
Current population of Saudi Arabia	>26 million
40% population under 18 years of age	= 10 million
1 in every five children affected	= 2 million
Estimated cost per child / year	=SR 5,000
Estimated economic cost / year	=SR 10 billion

The financial burden on patients with asthma in different Western countries ranges from \$500 million to \$1.8 billion per year. It is estimated that the Saudi national annual rate of increase in the prevalence of asthma is 15-20%. The data regarding the cost per patient is obtained from the US and is estimated to be SR7500 per patient, per year. Assuming an annual inflation rate of 4%, the projected total cost and the total number of patients with asthma are depicted in the following figure. For example, in the year 2015 the estimated number of people will be 4.25 million while the total cost of treatment is estimated at SR 10 billion [31].

2. DISCUSSION

The above review highlights many studies conducted in various parts of the Middle East and adjoining regions. Bronchial asthma appears to be affecting approximately 23% of the population in the Middle East region, particularly children, with even higher percentage suffering from allergic rhinitis [7]. This fact has not been clearly presented until now and requires individual attention in order to reduce morbidity and mortality. However, since no data is available on morbidity, not much can be presented in detail.

It is evident from our survey that most of the studies were conducted in different time periods and were based on different criteria with or without diagnostic protocols. Therefore, these data as a whole may not be truly representative of the diseases prevalent in this region. Nevertheless, some studies have used standardized protocols, such as International Studies for Allergy and Asthma in Children (ISAAC) and the

protocol used in Saudi Arabia [7]. The Saudi protocol was developed by an international panel comprising of late Prof. Ann Woolcock and her fellow colleagues (including Prof. JD Wilson) and was used in all recent studies done both in K.S.A and Pakistan.

The ISAAC questionnaires were also recently used in the studies conducted in Kuwait, Qatar, Oman, Iran,

Lebanon, Turkey, Egypt and Morocco. However, studies conducted by ISAAC came into existence only in the early 90's and only includes children of a certain age group (6-7 years and 13-14 years), while the Saudi protocol was initiated in 1987, and includes school age children (3 to 16 years of age. This protocol was frequently used in Saudi Arabia because of consistency and comparative reasons.

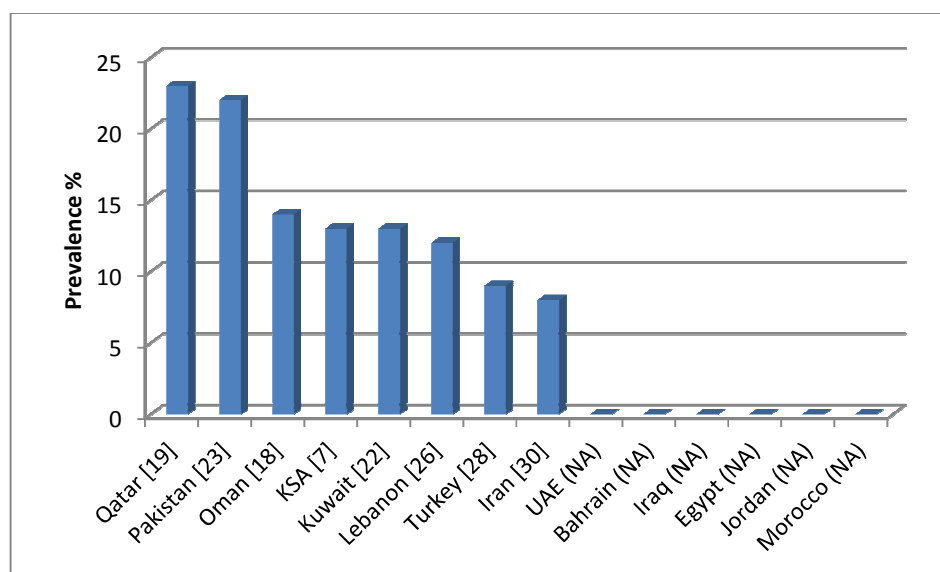


Fig. 4. Prevalence of eczema in Middle East and neighboring countries

Table 2. Unit cost per hospital / clinic visit. Adapted from cost of Asthma in KSA, Ministry of Health (COAKSA, MOH) [32]

Source:	Cost per visit or per day in Saudi Riyals			
	Outpatient visit	Emergency visit	In-patient adult per day	In-patient child per day
Original suggestion on Delphi questionnaire	145	50	428	291
High estimate	300	200	600	500
Low estimate	100	70	400	300
Mean figure	171	110	500	408

Table 3. Total cost of Saudi national asthma patient emergency room visits. Adapted from cost of asthma in KSA, Ministry of Health (COAKSA, MOH) [32]

	Adults (16+)	Children (5 to 15)
Total number of asthma sufferers using MoH	479,724	354,076
% needing emergency visit in past year (AIRKSA)	65%	80%
Number of MoH sufferers needing ER visit	311,821	283,261
Average number of ER visits per year (AIRKSA)	5.89	5.58
Total number of emergency visits per year	1,836,623	1,580,597
Unit cost of an emergency visit (Delphi)	110	110
Total annual cost of emergency visits SR	202,028,517	173,865,640

Table 4. Total cost of Saudi National in-patient treatments for Asthma in MoH facilities. Adapted from cost of Asthma in KSA, Ministry of Health (COAKSA, MOH) [32]

	Adults (16+)	Children (5 to 15)
Total number of asthma sufferers using MoH	479,724	354,076
% needing hospitalisation in past year (AIRKSA)	21%	30%
Number of MoH sufferers hospitalised	100,742	106,223
Average nights in hospital visits per year (AIRKSA)	5.96	5.53
Total number of nights hospitalised per year	600,422	587,413
Unit cost of an in-patient day/night (Delphi)	500	408
Total cost of in-patient visits SR	300,211,205	239,664,352

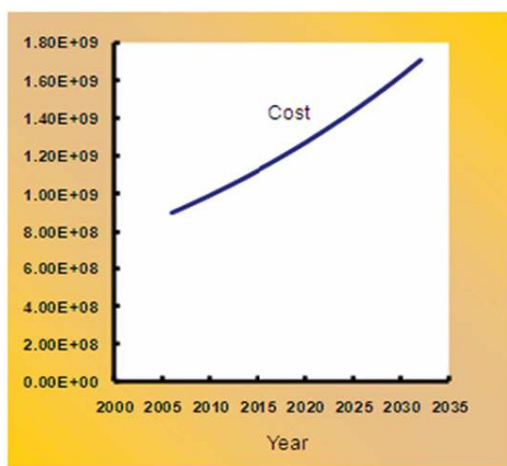
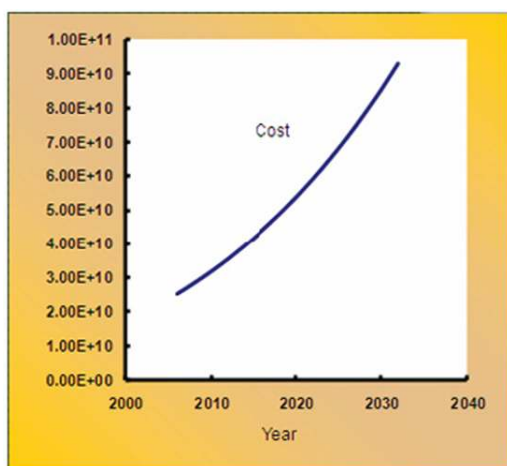


Fig. 5. Graphs showing the predicted cost for Asthma (left) and Cancer (right) (2000-2030). It shows that in 30 years, the cost of asthma will raise up to 100 billion Saudi riyal as compared to 1.8 billion Saudi riyal for Cancer. Adapted from the National Medical and Health Research Strategic Priorities, a KACST publication [31]

It appears that the current situation on this prevalence is a mixed basket of different protocols and therefore it is hard to determine a comparative level of the disease as a whole in the region. Similarly, diagnostic parameters such as Lung Function Test, Skin Prick Test and the determination of IgE used in the diagnosis of allergic patients vary from place to place. Hence, it is very important to carry out the study of the prevalence of allergic diseases in a professional manner by formulating a standard protocol including diagnostic parameters like Lung Function Test, Skin Prick Test, etc.

One of the important points to be noted is that different allergenic extracts were used to test their patients without background knowledge of prevalent inhalants and/or aeroallergens in respective countries. One of the reasons may be the lack of information of allergenic profiles, the thing that is evident from Tables 1, 2, 3 and 4 presented in this review. For instance, most of the countries have information on the prevalence but there is no allergen ever reported or published.

The diagnosis or cross-reactivity are not always obtained, therefore, local species has to be included but most of the studies do not specify the species obtained and this can cause a problem in the choice and selection of allergenic extract which may be different in the country.

Allergens are highly heterogeneous in nature and different species are more prominent in one region than the others. Knowledge of indigenous allergens should be provided to the patient by advertising in the local media. It is very important to create awareness in general public on various allergens that are prevalent in their region and the pollination season, in order to be able to take preventive measures such as avoiding contact with the outdoor allergens at peak pollination season and trying to eliminate all indoor allergens.

3. CONCLUSION

To sum up, the prevalence of allergic diseases and allergens vary from one country to another in the Middle East and neighboring countries. This variation in rates suggests that environmental factors may affect the development of these diseases and in the presence of aeroallergens.

The data indicates that allergic diseases such as bronchial asthma, allergic rhinitis, eczema, etc., do not only exist in high prevalence in the region but also the prevalence of these diseases is increasing day by day.

Our survey showed that the most common allergens were outdoor allergens: pollen grains (e.g. *Amaranthus*, *Chenopodium*, *Salsola*, etc.) and indoor allergens: House Dust Mites and fungal spores (e.g. *Alternaria*, *Aspergillus*, *Cladosporium*, *Penicillium*, etc.). The distribution of these aeroallergens is also different among the different countries depending on the climate and environment factors.

Therefore, it necessitates further studies on the subject in the region using a standardized protocol and physician diagnosis with standard diagnostic criteria for a better understanding of the disease. This will not only help health care providers to provide appropriate care and treatment but will also help the ministries and government department to plan and execute their health strategies to minimize, reduce and/or educate their suffering population and reduce billions of dollars currently provided by the government.

CONSENT

It is not applicable.

ETHICAL APPROVAL

It is not applicable.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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