

The prevalence of asthma and related symptoms in Middle East countries

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Abstract

Objectives: Asthma is a chronic inflammatory airway disease characterized by reversible airway constriction and airway hyperresponsiveness. Asthma is a world-wide problem and its prevalence varies among different parts of the world. There are insufficient data about the prevalence and risk factors of this disease in Middle East countries.

Data source: The objective of this review article was to determine the prevalence of asthma in Middle East countries by searching EMBASE, Medline, Web of Science and Google Scholar for articles about asthma prevalence in children and adults in this region.

Study selection: The prevalence of asthma in different countries and different cities of each country in the Middle East was reviewed in children and adults of both sexes. The possible risk factors for asthma in different areas were also reviewed from 1985 to 2012.

Results: The highest asthma prevalence in children and adults was 35.4% in Tehran, Iran by ISAAC phase I and 15% in Kuwait by self-designed questionnaire and the lowest prevalence was 1% in Kermanshah, Iran by ISAAC and 2% in Tehran, Iran by ECRHS questionnaire, respectively. Most studies showed that the prevalence of this common disease declines with increasing age.

Conclusion: The data showed that the prevalence of asthma varies among different countries and even among different cities of the same country. The common risk factors for this disease were genetic predisposition, cigarette smoking, family history of asthma and allergic diseases.

KEYWORDS

adults, asthma, children, Middle East, prevalence, risk factors

1 | INTRODUCTION

Asthma is defined by the history of respiratory symptoms such as 'wheeze, shortness of breath, chest tightness and cough that vary over time and intensity, with variable

expiratory airflow limitation'. Asthma diagnosis requires the presence of more than one of the respiratory symptoms, worsening of the symptoms at night and exacerbation of the symptoms by viral infection, exercise, allergens, changing weather or smoke. From 2011 to 2013, 235–300 million people worldwide suffered from asthma which may increase to 400 million in 2025.^{1–3} Asthma prevalence varies (1–18% or even more) among different countries and also different regions of the same country due to the diversity in ethnicity, race, sex, socioeconomic and environmental conditions, and

Abbreviations: GINA, Global Initiative for Asthma; ISAAC, International Study of Allergy and Asthma in Childhood; ECRHS, European Community Respiratory Health Survey; PDA, physician diagnosed asthma; AR, allergic rhinitis..

lifestyle.^{4,5} Industrialized countries and urban areas are among risk factors of the disease⁶ but exposure to infections in early years of life may prevent occurrence of asthma.⁷

The epidemiology of asthma with particular focus on its prevalence in children and adults of was reviewed in the Middle East as this information is absent or unclear for this region.

2 | METHODS

2.1 | Data sources

Search was carried out in PubMed, EMBASE, Medline, Web of Science and Google Scholar to get articles which evaluated asthma prevalence in children, adolescents and adults in Middle East countries from 1991 to 2014. Keywords included 'Asthma,' 'Prevalence,' 'Adult,' 'Children,' 'Middle East'.

2.2 | Definition

2.2.1 | Case definitions

A case definition describes a case by placing restrictions on time, place and person as well as to classify present conditions in a population.

'Ever asthma' refers to a chronic history of paroxysmal dyspnea with wheezing throughout the lifespan.

Current asthma: history of at least one episode of paroxysmal dyspnea with wheezing in the last 12 months.

Ever wheeze: history of wheezy breathing throughout the lifespan.

Current wheeze: history of wheezy breathing in the last 12 months.

2.2.2 | Other definition

The International Study of Asthma and Allergies in Childhood, is a worldwide epidemiological research program which initiated in 1991 to examine asthma, rhinitis and eczema in children. Its aim is to develop of disease monitoring, in other words to study the prevalence of asthma that is topic of this article.

ISAAC program: including three phases that has been designed to allow comparisons of the prevalence of asthma, allergic rhinoconjunctivitis and atopic eczema between children in different countries; Phase One: to evaluate the prevalence and severity of asthma, allergic rhinoconjunctivitis and atopic eczema in defined populations (6/7 and 13/14 years of age). Phase Two: to investigate possible aetiological factors, particularly those suggested by the findings of Phase One. Phase three: to survey time trends in the prevalence of

asthma, allergic rhinoconjunctivitis and atopic eczema in centres and countries which have partaken in Phase One.

ECRHS questionnaire: European Community Respiratory Health Survey questionnaire for determine the incidence and risk factors of asthma, allergic disease, atopy in adult.

Delphi technique: to seek out data for produce a consensus on the part of the respondent group.

2.2.3 | Sampling methods

Various ways for selecting the number of individuals for a specific research:

1. Simple random sampling: basic sampling method as we select with equal chance a sample for study from a population.
2. Stratified random sampling: taking samples from each stratum or sub-group of a population as proportion of each stratum in the sample should be the same in the population.
3. Multistage random sampling: taking a series of simple random samples in stages.
4. Systematic random sampling: random sampling with a system as the sampling frame, a starting point is chosen at random, and choices after that are at regular intervals.
5. Random cluster sampling: the total population is divided into groups or clusters and a simple random sample of the groups is selected.

3 | RESULTS

3.1 | Asthma prevalence in population aged less than 20 years in the Middle East countries

The prevalence of asthma in children and adolescents (aged <20 years) in the Middle East countries is presented in Table 1 and Figures 1 and 2 and the possible risk factors for asthma prevalence were presented in Table 3.

The prevalence of asthma in this age group was studied in 18 primary school in Bahrain which indicating ever wheeze prevalence of 10.8%.⁸ The prevalence of current wheeze, ever wheeze and ever asthma living in urban and in rural areas of Cyprus were increased from 2000 to 2008 (ever wheeze; 18.5 vs 25).⁹ Asthma prevalence in Greek-Cypriot (G/C) and Turkish-Cypriot (T/C) communities was higher in the younger compared to the older age group as well as in T/C community (with bedroom sharing, rural living and exposure to tobacco smoke) compared to the G/C community,¹⁰ (Tables 1 and 3, Figure 2).

In Egypt, asthma prevalence in children in the early months of the year (January-February; 2.0–1.9%) was higher

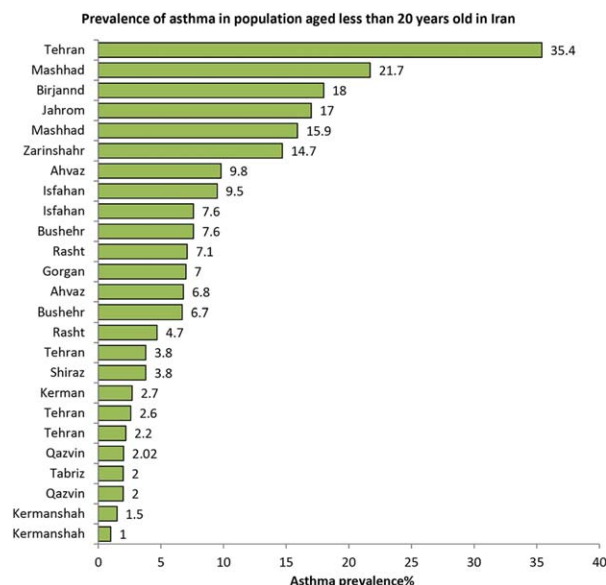


FIGURE 1 The prevalence of asthma in population aged less than 20 years from 1998–2012 in Iran

than latter months (May–June; 1.1–1.3%), in rural residence more than urban residence¹¹ and in younger more than older children.¹² Family history of allergy and bad housing were also documented as risk factors associated with prevalence of asthma in Egypt.^{7,13} The prevalence of asthma in children, in different region of Iran were examined by several studies using various questionnaires.^{4,14–34} The results showed variable prevalence of asthma from 1% in Kermanshah using ISAAC I & II to 35.4% in Tehran using ISAAC I questionnaires (Figure 1). The results of four studies about the prevalence of asthma in Iraq showed 8.9% prevalence in older and 15.55% in younger children. The environmental pollution, family history of asthma and exposure to cigarette smoking were recognized as a serious risk factor for asthma prevalence in this country,^{35–38} (Tables 1 and 3, Figure 2).

Seven studies regarding the prevalence of asthma in Israel showed reduction of its prevalence with increased age.^{39–45} Genetic, ethnic, environmental and nutritional factors were suggested to be risk factors for the prevalence of asthma.^{41,44} Asthma prevalence and wheeze were also increased from 1980 to 1989⁴² and from 1986 to 1990⁴³ but asthma ever prevalence was decreased from 1999 to 2008.⁴⁵ The results of two studies about the prevalence of asthma in Jordan indicated its prevalence of 8.7–10% in 6–7 years, 4.1% in 6–12 years and 8.8–9.5% in 13–14 years children.^{46,47} The results of three studies showed moderate prevalence of asthma in Kuwaiti's children.^{2,48,49} The prevalence of asthma was 13.4–27.6% in 13–14 years and 18% in 5–16 years old children (Tables 1 and 3, Figure 2).

The prevalence of asthma in Lebanon was studied in three studies^{50–52} which showed reduction of asthma prevalence with increased age and also was higher in Beirut than

south Lebanon. In Oman, the prevalence of asthma was 10.5–10.6% in 6–7 years and 20.7–19.8% in 13–14 years old children.^{53–55} The prevalence of current wheeze and exercise-induced wheeze in older children was also higher than younger children. The prevalence of current wheeze and any wheeze during the last 12 months was also showed increased between 1995 and 2001 in Oman. Asthma prevalence in children, in Pakistan, increased during 2002–2007 from 6% to 15.8% and family smoking and the presence of pets in houses were associated with the prevalence of asthma.^{56,57} The prevalence of current wheeze in Palestine was higher in younger children living in camps compared to children in cities or villages,^{58,59} (Tables 1 and 3, Figure 2).

The prevalence rates of asthma among schoolchildren in Qatar, was high and close to the neighbouring countries which could be due to genetic, environmental, and socioeconomic factors in this country.⁶⁰ High asthma prevalence and increasing the prevalence of this disease between 1986 and 1008 were shown in Saudi Arabia.^{61,62} The prevalence of asthma ever in children 6–7 and in 13–14 years old in Syria was shown as 4.5% and 5.1%, respectively.⁶³ In Turkey high prevalence of asthma and wheezing were seen that was due to poor socioeconomic condition and high rate of passive smoking as 49.3% of children had smoking parents⁶⁴ and the prevalence of the disease was higher in urban areas.⁶⁵ The related risk factors for the prevalence of asthma in Turkey were reported to be family history of atopy (45.6%), passive smoking (67.7%), contact with animals (21%),^{5,66} food allergy (12.8%) and eczema (5.9%),^{67,68} (Tables 1 and 3, Figure 2).

The prevalence of asthma in the United Arab Emirates was examined in two studies which showed that allergic rhinitis (AR) patients had a threefold risk of asthma compared to patients without AR (23.8 and 7.5%, respectively).^{69,70} Asthma prevalence was higher in children of Shabwa (urban area = 19.4%) than in Sana'a (rural area = 10.8%) in Yemen.⁷¹ (Tables 1 and 3, Figure 2).

3.2 | Asthma prevalence in adults (aged more than 20 years) in Middle East countries

The prevalence of asthma in adults in the Middle East countries was shown in Table 2 and Figure 3 and the possible risk factors for asthma prevalence were presented in Table 3.

The main risk factors for prevalence of asthma in adult population of Mashhad city was reported as; family history of asthma, allergy and exposure to cigarette smoke in 1999.⁷² In Tehran city, the prevalence of wheezing and dyspnea were 10.8% as well as current asthma was also 2% were a little more than ECRHS median (9.8% and 4.5% respectively) and was higher in active and passive smokers than non-smoker groups.⁷³ In adults population of Urmia, the

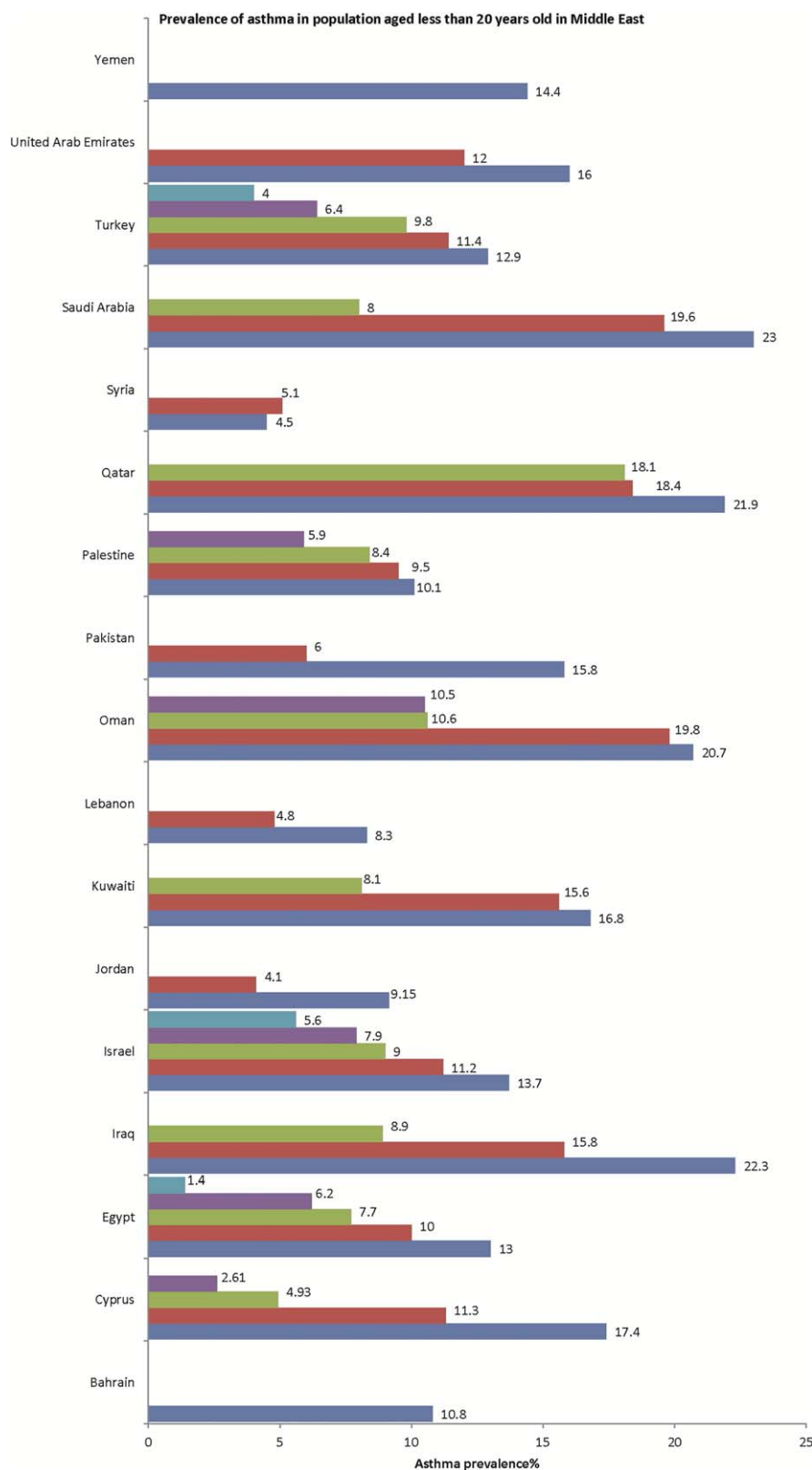


FIGURE 2 The prevalence of asthma in population aged less than 20 years in Middle East countries (the different colours mean different studies in each country)

prevalence of current wheezing (last 12 months), resting breathlessness, exercise breathlessness, chest tightness, nocturnal shortness of breath, nocturnal cough, and asthma

attack were 10.2%, 29.1%, 10.2%, 7.3%, 16.5%, 19.7% and 3.1% respectively. In all cases, the prevalence was higher in smokers than non-smokers.⁷⁴

TABLE 1 The prevalence of asthma in population aged less than 20 years in Middle East countries

Source population			Population		Questionnaire	Sampling method	Time	Ever asthma/wheeze (%)			Current asthma/wheeze (%)			Refs.
Country	City	Subjects	Age Years old	Gender				Gender						
				Year				Male	Female	Total	Male	Female	Total	
Bahrain	–	1951	6–7	ISAAC	Systematic Random	2010	13.3	8.7	11.3	–	–	–	2.1	8
Cyprus	Nicosia & Limassol	4944	7–8	ISAAC	–	2000	–	–	11.3	–	–	–	6.9	9
	Greek	2216	7–8	ISAAC	–	2007–9	–	–	2.61	–	–	–	8.71	10
	Turkish	2353	7–8	ISAAC	–	2007–9	–	–	4.93	–	–	–	11.43	10
	Greek	2452	13–14	ISAAC	–	2007–2009	–	–	1.82	–	–	–	4.12	10
	Turkish	3135	13–14	ISAAC	–	2007–2009	–	–	2.98	–	–	–	5.59	10
	Nicosia & Limassol	2216	7–8	ISAAC	–	2008	–	–	17.4	–	–	–	8.7	9
Egypt	Nile Delta	2720	5–16	ISAAC Phase I	Systematic Random	2009	8.6	6.9	7.7	–	–	–	–	7
	Sohag	12 612	3–12	Self-designed	–	2010	0.88	0.49	1.4	–	–	–	–	11
	Elmenofia & Tilwana	1250	5–10	Similar to ISAAC	Systematic Random	2010	13	12.5	13	–	–	–	–	12
	Elmenofia & Tilwana	1250	11–15	Similar to ISAAC	Systematic Random	2010	8.5	12.8	10	–	–	–	–	12
	Assiut district	1048	13–17	ISAAC	Systematic random	2012	7.5	5.1	6.2	–	–	–	–	13
Iran	Isfahan	3828	6–11	ISAAC	Systematic random	1998	8.4	6.9	7.6	3.6	4.4	3.9	–	19
	Isfahan	3924	12–15	Self-designed	Random cluster	1998–1999	12.7/24.7	6.2/13.4	9.5/19.1	9.8	4.7	7.3	–	18
	Mashhad	4781	14–20	Self-designed	–	1999	13.8	17.9	15.9	–	–	–	–	23
	Mashhad	5534	11–16	Self-designed	–	2000	19.9	24.76	21.7	–	–	–	–	24
	Kerman	2217	6–12	ISAAC	Random cluster	2000	3.2	2.3	2.7	–	–	–	–	22
	Tehran	611	< 5	ISAAC	–	2001	4.5	3.1	3.8	11.9	7.5	19.4	–	31
	Zarinshahr	1309	6–13	ISAAC	Random cluster	2001	12.9	16.3	14.7	4.5	7	5.9	–	32
	Rasht	3065	6–7	ISAAC Phase III	Simple random	2001–2002	9.1	5.6	7.1	21.3	18.4	19.6%	–	28
	Rasht	3009	13–14	ISAAC Phase III	Simple random	2001–2002	5.6	3.6	4.7	28.8	19.8	24.2	–	28
	Tehran	3015	6–7	ISAAC	Simple random	2001–2002	1.7	2.7	2.2	57.5	58.1	57.8%	–	28
	Tehran	3125	13–14	ISAAC	Simple random	2001–2002	2.2	3	2.6	51.6	54.1	52.8%	–	28
	Tehran	3015	6–7	ISAAC phase III	Simple random	2001–2002	1/7.5	1.2/8.1	1.1/15.6	28	29.6	57.6	–	29
	Tehran	3125	13–14	ISAAC phase III	Simple random	2001–2002	1.2/8.8	1.4/8.4	1.3/17.3	26.9	25.5	52.5	–	29
	Birjamd	3540	13–14	ISAAC	Simple random	2002	–	–	18	–	–	10.1	–	15
	Tehran	2040	7–18	ISAAC phase I	Random cluster	2002–2003	37.1	33.5	35.4	–	–	–	–	30
	Gorgan	2800	12–13	ISAAC Phase I	Random cluster	2003	8.5	5.8	7	23.1	17.5	20.1	–	17
	Qazvin	2518	7–11	ISAAC Phase I	–	2003	2.3/11	1.5/10	2/10	11	9.4	10.2	–	25
	Qazvin	2550	12–14	ISAAC Phase I	–	2003	2.1/26	2.4/25.3	2.2/26	17.6	17.7	17.6	–	25

(Continues)

TABLE 1 (Continued)

Source population		Population		Sampling method	Time	Ever asthma/wheeze (%)			Current asthma/wheeze (%)			Refs.
Country	City	Subjects	Age Years old			Questionnaire	Year	Gender	Male	Female	Total	
Iraq	Jahrom	100 ^a	<12	ISAAC	2004	ISAAC	2004	Gender	–	–	17 ^b	10
	Kermanshah	3037	6–7	ISAAC I & II	2007	Simple random	2007	Gender	0.57	1	1	1.97
	Kermanshah	3199	13–14	ISAAC I & II	2007	Simple random	2007	Gender	0.25	0.75	1.5	6.2
	Shiraz	3000	13–14	ISAAC	2009	Systematic random	2009	Gender	4.3	3.4	3.8	–
	Tabriz	1058	12–14	ISAAC	2009	Simple random	2009	Gender	5.4	1.8	3.7	2.9
	Ahvaz	1410	6–7	ISAAC	2010	Systematic random	2010	Gender	–	–	6.8	7.4
	Ahvaz	1450	13–14	ISAAC	2010	Systematic random	2010	Gender	–	–	9.8	10.3
	Bushehr	1280	6–7	ISAAC Phase I	2011–2012	ISAAC Phase I	2011–2012	Gender	2.4/9.53	4.2/10.31	6.7/19.8	10.9
	Bushehr	1115	13–14	ISAAC Phase I & III	2011–2012	ISAAC Phase I & III	2011–2012	Gender	3.8/8.6	3.5/9.3	7.6/17.9	11.4
	Baghdad	2889	6–15	ISAAC	2000–2002	Random cluster	2000–2002	Gender	22.1	22.5	22.3	19.9
Israel	Baghdad	2262	6–12	ISAAC	2000–2002	–	2000–2002	Gender	29.4	27.8	28.4	–
	Basra	424	<5	Self-designed	2001	–	2001	Gender	16.4	15.1	15.8	–
	–	2875	11–14	ISAAC	2009	–	2009	Gender	4.86	4.03	8.9	–
	–	737	13–14	ATS-NHLI	1980	–	1980	Gender	–	–	5.6/8.8	–
	–	834	11	ATS-NHLI	1980	–	1980	Gender	–	–	8.4/11.3	–
	Holon	3041	14–18	–	1985–1989	–	1985–1989	Gender	–	–	–	9
	–	13363	17	Self-designed	1986	–	1986	Gender	–	–	7.9	5
	–	963	13–14	ATS-NHLI	1989	–	1989	Gender	–	–	11.2/14	–
	–	802	11	ATS-NHLI	1989	–	1989	Gender	–	–	13/16	–
	–	21807	17	Self-designed	1990	–	1990	Gender	–	–	9.6	5.9
Jordan	–	11157	13–14	ISAAC	1997	Simple random	1997	Gender	15/22.2	12.5/25.4	13.7/23.8	7/17.9
	–	300000	17	Medical history	1999	–	1999	Gender	9.7	–	9.7	–
	–	300000	17	Medical history	2008	–	2008	Gender	8.1	–	8.1	–
	Irbid	3182	6–12	–	1996	–	1996	Gender	–	–	4.1	8.3
	Amman	2598	6–7	ISAAC phase III	2009	Simple random	2009	Gender	10.1/27.5	8/24.8	10/35.5	15.3
	Almafraq	2193	6–7	ISAAC phase III	2009	Simple random	2009	Gender	10.1/27.5	8/24.8	8.7/23.5	15.3
	Amman	2447	13–14	ISAAC phase III	2009	Simple random	2009	Gender	10.1/27.5	8/24.8	8.8/22.8	15.3
	Almafraq	1870	13–14	ISAAC phase III	2009	Simple random	2009	Gender	10.1/27.5	8/24.8	9.5/28	15.3
	–	3110	13–14	ISAAC phase I	1995–1996	–	1995–1996	Gender	–	–	16.8/25.9	–
	–	2822	13–14	ISAAC phase III (written questionnaire)	2001–2002	Random table	2001–2002	Gender	15.2	11.7	13.4	9.3
Kuwaiti	–	2822	13–14	ISAAC phase III (video questionnaire)	2001–2002	Random table	2001–2002	Gender	35.6	20.5	27.6	24.3
	–	3115	13–14	ISAAC	2005	Simple random	2005	Gender	9.3	7.4	8.3	24.1
	–	3909	5–12	ISAAC	2005	Simple random	2005	Gender	16.7	13.1	14.8	13.7
Lebanon	–	3115	13–14	ISAAC	2005	Simple random	2005	Gender	9.3	7.4	8.3	24.1
	–	3909	5–12	ISAAC	2005	Simple random	2005	Gender	16.7	13.1	14.8	13.7

(Continues)

TABLE 1 (Continued)

Source population			Population		Age Years old	Questionnaire	Sampling method	Time Year	Ever asthma/wheeze (%)			Current asthma/wheeze (%)			Refs.
Country	City	Subjects	Gender	Male					Female	Total	Gender	Male	Female	Total	
Oman	–	3893	6–7	ISAAC phase I	Stratified multistage	1995	12.8/15.8	8/11.3	10.5/13.8	8.5	5.3	7.1	54		
	–	3174	13–14	ISAAC phase I	Stratified multistage	1995	21.4/16.3	20/14.9	20.7/15.6	9.2	8.6	8.9	54		
	–	4126	6–7	ISAAC phase III	–	2001	–	–	10.6	–	–	8.4	55		
	–	3753	13–14	ISAAC phase III	–	2001	–	–	19.8	–	–	8.4	55		
Pakistan	south Punjab	3180	3–18	–	Random	2002–2003	5.6	5.5	6	–	–	–	57		
	Karachi	2325	3–16	ISAAC	–	2007	7.78	8.01	15.8	8.7	3	11.7	56		
Palestine	Irbid	3182	6–12	–	–	1996	–	–	4.1	–	–	8.3	47		
	–	7030	12–15	ISAAC phase III	Two-stage stratified	2000	7.9	4.4	5.9	8.2	6.6	7.2	58		
	Ramallah	1048	6–7	ISAAC phase III	Two-stage stratified	2000	11.4/18.3	7.8/16.4	10.1/18.3	9.7	8.2	10.2	59		
	Ramallah	2334	8–12	ISAAC phase III	Two-stage stratified	2000	11.4/18.3	7.8/16.4	9.5/17	9.7	8.2	8.4	59		
	–	7325	5–8	ISAAC phase III	Two-stage stratified	2001	9.7	7.3	8.4	11.1	8.3	9.6	58		
	Doha	1390	6–8	ISAAC I & II	Multistage stratified	2003–2004	30.7	13.3	21.9	–	–	–	60		
Qatar	Doha	1497	9–11	ISAAC	Multistage stratified	2003–2004	21.9	13.6	18.1	–	–	–	60		
	Doha	396	12–14	ISAAC	Multistage stratified	2003–2004	22.9	12.9	18.4	–	–	–	60		
Saudi Arabia	Jeddah and Riyadh	2123	8 & 16	ISAAC	–	1986	–	–	8	–	–	–	62		
	Hail and Gizan	1008	8 & 16	ISAAC	–	1995	–	–	23	–	–	–	62		
	Riyadh	3073	16–18	ISAAC	two stage cluster	2009–2010	21.5/26.5	17.8/24.3	19.6/25.3	20.3	16.9	18.5	61		
	–	5107	6–7	ISAAC Phase III	Random	2001–2002	–	–	4.5/9.9	–	–	5.2	63		
Syria	–	9068	13–14	ISAAC Phase III	Random	2001–2002	–	–	5.1/9.4	–	–	5.2	63		
Turkey	Adana	2334	6–14	Self-designed	Multistage stratified	1993–1994	–	–	12.9	–	–	8.4	64		
	Istanbul	2276	6–15	ISAAC	–	1996–1997	4.3/13.9	3.7/13.5	4/13.7	7.4	6.9	7.2	66		
	Istanbul	2232	6–12	ISAAC	Random	1997	4.91	4.89	9.8/15.1	–	–	8.2	68		
	–	2529	6–14	ISAAC	Random	1998	–	–	11.4/14.7	–	–	4.8	67		
	Duzce	2330	6–16	ISAAC	Random	2001–2002	7.7	5.3	6.4/24.5	–	–	8.1	65		
	Denizli	4078	13–14	ISAAC (Written)	–	2008	13.1/13.1	12.6/13.9	11.2/13.5	6.3	6.1	6.3	5		
	Al-Ain	2802	13–19	ISAAC	multistage random	2007–2008	17	14	16	–	–	6.7	69		
United Arab Emirates	Al-Ain	3733	>19	ISAAC	multistage random	2007–2008	11	13	12	–	–	6.1	69		
	–	1028	13–14	ISSAC	Random list	2010	18.6	12.9	15.9	–	–	–	71		

Red = ever asthma, green = current asthma.

^aasthmatic patients.^bwheezing percent.

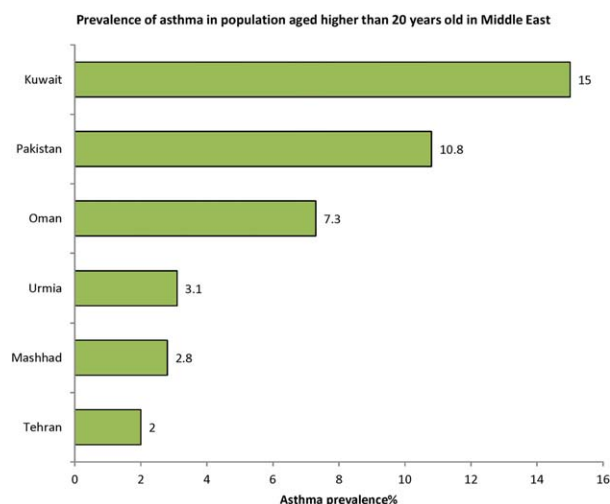


FIGURE 3 The prevalence of asthma in population aged more than 20 years old from 1999–2009 in Middle East countries

In Iraq, family history of allergic rhinitis, asthma, passive smoking were 15.5, 11.55 and 21.7%, respectively. The prevalence of asthma was higher in females than males.⁷⁵ The prevalence of asthma in adult population of Kuwait was also 15%.² Asthma prevalence among Omani adults was associated with smoking and allergy.⁵³

Asthma prevalence among male worker of leather tannery in Karachi was 10.8% and 34 subjects of 69 asthmatic patients had work-related asthma which was also significantly associated with smoking and allergy.⁷⁶ The prevalence of allergic conjunctivitis, allergic dermatitis, and eczema among undergraduate students were 40.8%, 34.9% and 14.9% respectively and dust was the most common cause (22%) of the above disorders.⁶

4 | DISCUSSION

The present review article aimed to determine the prevalence of asthma in Middle East countries during 1985–2014. The prevalence of asthma in different countries of the region and in different cities of each country was reviewed in children and adults of both sexes.

The highest asthma prevalence in children was reported in Tehran, Iran by ISAAC phase I as 35.4% and the lowest prevalence as 1% in Kermanshah, Iran by ISAAC questionnaire. Similarly the highest asthma prevalence in adult was 15% in Kuwait by Self-designed questionnaire and the lowest prevalence was 2% in Tehran, Iran by ECRHS questionnaire. In addition, the prevalence of asthma in Middle East region was higher in males than females in most studies. The prevalence of asthma was higher in children and adolescents (aged less than 20 years) than adult population (aged more than 20 years) and the results of most studies showed a decline in the prevalence of this common disease

TABLE 2 The prevalence of asthma in population aged more than 20 years in Middle East countries

Country	City	Age	Questionnaire	Sampling method	Population	Years	Ever asthma/wheeze (%)			Current asthma/wheeze (%)			Refs.
							Male	Female	Total	Male	Female	Total	
Iran	Mashhad	≥20	Self-designed	Random	5579	1999	2.4	3.2	2.8	2.32	3	2.67	72
Pakistan	Karachi	27 ± 9	Delphi technique	–	641	2003–4	–	–	10.8	–	–	–	76
Iran	Tehran	20–44	ECRHS	Random	5500	2004–5	1.5	1.7	1.6	0.7/30.5	1.3/20.1	2.0/24.0	73
Iran	Urmia	20.8 ± 3.5	ECRHS	Random	1500	2004–5	–	–	3.1	–	–	19.7	74
Kuwait	–	>20	Delphi technique	–	93923	2005	–	–	15	–	–	–	2
Iraq	Baghdad	38	–	–	225 ^a	2007–8	22.2	77.8	25.8	–	–	–	75
Oman	–	>20	Delphi technique	–	1321501	2009	–	–	7.3	–	–	–	53

^aasthmatic patients.

TABLE 3 The possible risk factors for asthma in the Middle East countries

Country	Population	Asthma prevalence (%)	Area of residence		Family history in asthma subjects (%)		Smoking in asthma subjects (%)		Exposure to animals	Refs.
			Rural (%)	Urban (%)	Asthma	Allergy/Atopy	Active	Passive		
Cyprus (2000)	4944	11.3	9.7	11.9	–	–	–	–	–	10
Cyprus (2008)	2216	17.4	18.4	17.1	–	–	–	–	–	10
Egypt	12612	1.4	0.89	0.51	53.4	–	–	57.8	47.9	11
Egypt	1250	13	7.1	14	–	20.7	–	–	–	12
Egypt	2720	7.7	8	7	76.5	76.6	–	47.8	–	7
Egypt	1048	6.2	5.2	6.4	14.2	31	–	5.1	–	13
Iran	2800	7	–	–	27.7	51.4	–	–	–	17
Iran	3924	9.5	–	9.5	37.5	27.9	–	47	72.6	18
Iran	100	–	–	–	70	–	–	56	22	20
Iran	6236	2.6	–	–	–	–	–	30	–	21
Iran	2217	2.7	–	–	15.9	7.1	–	3.4	–	22
Iran	4781	15.9	–	–	31	47.9	–	–	34.8	23
Iran	5534	21.7	–	–	39.2	55.2	–	49.1	–	24
Iran	1508	2	–	–	–	–	–	4.3	5.6	27
Iran	611	3.8	–	–	8.3	33.3	–	29.2	–	31
Iran	1309	14.7	–	–	–	–	–	17.7	–	32
Iraq	2262	28.47	25.2	29.2	40.2	–	–	33.8	–	36
Iraq	424	15.8	15	16.3	44.8	41.8	–	64.2	50.7	37
Iraq	2875	8.9	–	–	53.1	62.5	–	41.8	79.8	38
Israel (1980)	737	5.7	–	–	27.3	–	–	27.5	–	40
Israel (1989)	963	11.2	–	–	28.4	–	–	29.6	–	40
Israel	10057	13.7	11.5	14.2	–	–	–	–	–	41
Jordan	9108	26.1	25.5	26.8	–	–	–	–	–	46
Pakistan	2325	15.8	–	–	–	–	–	77.8	49.5	56
Palestine	7325	8.4	8.3	17	–	–	–	–	–	58
Palestine	7030	5.9	6.5	11.6	–	–	–	–	–	58
Palestine	3382	9.4	22.9	15.6	–	–	–	–	–	59
Qatar	3283	19.8	–	–	41.1	47.2	–	–	–	60
Turkey	4078	11.2	–	–	–	40.2/20.2	14.7	26.5	12.9	5
Turkey	2334	12.9	–	–	–	12.5	–	49.3	–	64

(Continues)

TABLE 3 (Continued)

Country	Population	Asthma prevalence (%)	Area of residence		Family history in asthma subjects (%)		Smoking in asthma subjects (%)		Exposure to animals	Refs.
			Rural (%)	Urban (%)	Asthma	Allergy/Atopy	Active	Passive		
Turkey	2330	6.4	40.3	59.7	–	–	–	60.4	11.4	65
Turkey	2276	13.7	–	–	–	45.6	–	67.7	21	66
Turkey	2232	9.8	–	–	15.6	–	–	63.2	21.7	68
United Arab Emirates	6543	13.3	–	–	25	29	–	–	–	70
Yemen (Sana)	560	12.6	10.8	14.4	–	–	–	–	–	71
Yemen (Shabwa)	372	20.3	21.2	19.4	–	–	–	–	–	71
Iran	5579	2.8	–	–	40.3	43.7	–	28.5	–	72
Iraq	225 ^a	25.8	–	–	11.5	33.7	–	21.7	15.4	75

^aasthmatic patients.

with increasing age. Some studies, however, showed that the prevalence of asthma increased with age.^{13,20} However, some studies indicated higher asthma prevalence in females than male subjects. Therefore, the prevalence of asthma in different age groups using more precious age cut off in studied population should be done in the future.

There was considerable variation in the prevalence of asthma in different countries of Middle East and even in different region of each country. For example, the prevalence of asthma in population aged less than 20 years was varied from 1 to 35.4% in children of different region of Iran in studies performed from 1998–2014. These variations could be due to difference in environmental, food intake, ethnicity, and life style. However the most probable reason for these variations is the differences in the questionnaire and the method used for studying of the prevalence of asthma. Therefore, studies using standard method and questionnaire are required to figure out more precise prevalence of this common disease in the region.

In addition, in some countries of the region, only few studies have been done regarding the prevalence of asthma. In most countries of the region only two studies have been done on the prevalence of asthma in subjects aged less than 20 years old and in Qatar just one study was fund. The prevalence of asthma in adult population (aged more than 20 years) was studied only in six countries in the region and in four of them only one study has been done. Therefore, more studies should be done in different countries and even in various cities of each country of the region.

The results of some studies also showed a rise in the prevalence in recent years both in children^{9,14,21,26,40–43,56,57,62}

and adult populations.^{73,74} The rise in the prevalence of asthma could be due to industrial development and increased environmental pollution in those countries. However, some studies showed reduction of asthma prevalence with the advanced time (19, 22, 48, 65 and 67). The reason of these findings could be due to health caring program in those countries. However, more precise studies in this regard were also should be undertaken in the region in the future.

The common risk factors accounting for the prevalence of this disease were genetic predisposition, environmental pollution, viral infection, family history of allergy, family history of asthma and cigarette smoking. Regarding the risk factors affecting the prevalence of asthma also, more standard and carefully designed studies are needed to be done in the region in the future. For instance, the effect of environmental pollution on the prevalence of asthma should be examined by comparing the prevalence of the disease in area with and without a specific environmental pollution. In these regard, the results presented in the current review also showed higher asthma prevalence of asthma in urban compared to rural areas.

This review provided valuable information regarding the prevalence of asthma in the Middle East countries and the possible risk factors affecting the incidence of this disease which may help to guide future planning for management and prevention of the disease at an early stage.

5 | CONCLUSIONS

The prevalence of asthma in different countries of Middle East during 1985–2014 showed the highest asthma prevalence

in children and adults as 35.4% in Tehran, Iran by ISAAC phase I and 15% in Kuwait by Self-designed questionnaire and the lowest prevalence as 1% in Kermanshah, Iran by ISAAC and 2% in Tehran, Iran by ECRHS questionnaire, respectively. Most studies showed that the prevalence of this common disease declines with increasing age. In addition, the prevalence of asthma in Middle East was higher in males than females. The common risk factors for this disease were genetic predisposition, environmental pollution, viral infection and cigarette smoking. The information regarding the prevalence of asthma and risk factors for incidence of this disease provided in this review may help to guide future planning, management and prevention of the disease at an early stage.

CONFLICT OF INTERESTS

The authors declare that there is no conflict of interest.

AUTHOR CONTRIBUTIONS

Article search, first version of manuscript drafting, help in manuscript revising: Azam Alavinezhad.

Topic suggestion, help in first version manuscript drafting, help in manuscript revising: Mohammad Hossein Boskabady.

ETHICS

This study is in accordance with the Declaration of Helsinki.

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