

# Epidemiological Profile and Clinical Characteristics of the Childhood Asthma Among School Students in Dubai, UAE

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## Abstract

**Background:** Epidemiologic data estimate that nearly 300 million people worldwide suffer from asthma with expectation that this number will grow by more than 100 million by 2025. Annually 250,000 deaths are attributed to this disease. with approximately 500,000 hospitalizations per year and 13 million missed school days. Asthma is the third-ranking cause of hospitalization among children under 15 In the UAE. **Objectives:** To study the clinical and epidemiological profile, and socio-demographic risk factors of the childhood asthma in Dubai. **Methodology:** A cross-sectional study was conducted among students in preparatory and secondary schools “Governmental and Private” in Dubai, U.A.E. A sample of 1639 students was selected randomly by multistage stratified random sampling technique. **Results:** 16.7% have had an asthma attack at some point of time. About 38.5% had asthma at age of less than 3 years. most of the studied students had no wheezing or whistling in the chest at any time in the past (83.5 while 72.9% had wheezes within the last 12 months. As regards the frequency of asthma symptoms per week it can be noted that 8.5% had the symptoms over the day. Regarding sleeping, it was disturbed less than once weekly in 35.2%. Speech limitation due to wheezing was reported by 42.2%, and 66.8% experienced wheezes during and after exercise. As regards using inhalers, the frequency of use ranged from less than or twice weekly in 57.8%. **Conclusion:** Early onset of asthmatic attacks was clearly eminent among the study sample. Although Boys had higher statistically significant propensity to acquire bronchial asthma, gender revealed no difference concerning severity. Emirian students and those in governmental schools were more affected with bronchial asthma. Although apparently higher among low educated mothers, illiterate fathers had statistically significant higher percentage of asthmatic children. **Recommendations:** A national asthma surveillance system should be developed in order to early detect and manage bronchial asthma among school children.

## Keywords

Childhood Asthma, Profile, Dubai

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## 1. Introduction

Bronchial asthma is defined as a chronic, inflammatory lung disease which characteristically presents by cough, dyspnea,

wheezing and chest tightness which occurs in paroxysms and is usually related to specific triggering events involving partial or complete reversible airway narrowing plus increased airways responsiveness to a variety of stimuli. <sup>(1)</sup> Asthma and obesity are recently evolved into two major

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public health concerns in developed countries.<sup>(2)</sup> Asthma prevalence exists globally in wide variations.<sup>(3)</sup> It is the most common chronic disease facing the childhood in first world countries. Recurrent asthma-like symptoms were reported in approximately 32 percent of preschool children in the United States and Europe.<sup>(4)</sup> Globally, epidemiologic data estimate that nearly 300 million people worldwide suffer from asthma with expectation that this number will grow by more than 100 million by 2025. Annually 250,000 deaths are attributed to this disease.<sup>(5)</sup> with approximately 500,000 hospitalizations per year and 13 million missed school days.<sup>(6)</sup> Asthma is the third-ranking cause of hospitalization among children under 15.<sup>(7)</sup>

In the UAE, in Al Ain area a study held between 2007- 2010 showed that the prevalence of asthma in the study group aged 13-19 years was 16%, while that in the adult group 19 years and above was 12%.<sup>(8)</sup>

Asthma is a large and growing threat to children's health and well-being.<sup>(1)</sup> It affects 5-10% of the population or an estimated 23.4 million persons, including 7 million children in the U.S.<sup>(9)</sup> Asthma is the most common chronic disease of childhood. Almost 1 in 8 school-aged children are affected by asthma, and 10% of children (compared with 5% of adults) take medication for it.<sup>(10,11)</sup> Worldwide, an estimated 300 million people are affected by asthma. Based on the application of standardized methods to the measurement of the prevalence of asthma and wheezing illness in children and adults, it appears that the global prevalence of asthma ranges 1-18% of the population in different countries.<sup>(5)</sup> There is a good evidence that international differences in asthma symptom prevalence have been reduced, particularly in the age 13-14 year age group, with decrease in prevalence in North America and Western Europe and increase prevalence in regions where prevalence was previously low. Although there was little change in the overall prevalence of current wheeze, the percentage of children reported to have had asthma increased significantly, possibly reflecting greater awareness of this condition and/or changes in diagnostic practice. The increases in asthma symptoms prevalence in Africa, Latin America and parts of Asia indicate that the global burden of asthma is continuing to rise, but the global prevalence differences are lessening.<sup>(12)</sup> Asthma is a leading chronic illness among children and youth in the United States. In 2007, 5.6 million school-aged children and youth (5-17 years old) were reported to currently have asthma; and 2.9 million had an asthma episode or attack within the previous year. On average, in a classroom of 30 children, about 3 are likely to have asthma.<sup>(13)</sup> In a study done in Egypt in 2009 the overall prevalence of asthma among school children was 7.7% (8% in urban areas and 7% in rural areas).<sup>(14)</sup> In a study conducted in State of Qatar, the school

children aged from 6-14 year revealed a prevalence of bronchial asthma as high as 19.8 % in 2004.<sup>(15)</sup> In between 2007-2009 in Saudi Arabia (Riyadh), a study among the same age range (6-14) revealed that the prevalence of asthma among school children was 11.4%<sup>(16)</sup> while in Oman, the prevalence of asthma reached 10.5% and 20.7% in 6-7 and 13-14 years old Omani children respectively.<sup>(17)</sup>

The World Health Organization (WHO) has estimated that 15 million disability-adjusted life-years are lost annually due to asthma, representing 1% of the total global disease burden. Annual worldwide deaths from asthma have been estimated at 250,000 and mortality does not appear to correlate well with prevalence. There are insufficient data to fully explain the variations in prevalence within and between populations. Although from the perspective of both the patient and society the cost to control asthma seems high, the cost of not treating asthma correctly is even higher.<sup>(5)</sup>

Children with asthma are at an increased risk of experiencing asthma-related respiratory symptoms in adult life.<sup>(18)</sup> Asthma is one of the leading causes of school absenteeism. In 2003, an estimated 12.8 million school days were missed due to asthma among more than 4 million children who reported at least one asthma attack in the preceding year.<sup>(19)</sup> Low-income populations, minorities, and children living in inner cities experience more emergency department visits, hospitalizations, and deaths due to asthma than the general population.<sup>(20)</sup> Two old studies on 1994 and 2000 in the UAE among students aged 6-13 showed that the prevalence of asthma was 13.6 %<sup>(21)</sup> and 13 %<sup>(22)</sup> respectively. In a recent study in the UAE, in Al Ain area which was held between 2007- 2010 showed that the prevalence of asthma in the group aged 13-19 years was 16%, while that in the adult group 19 years and above was 12%.<sup>(8)</sup>

Since Bronchial asthma constitutes an important health problem worldwide related with significant impact in terms of morbidity and mortality, being with allergic rhinitis, the most frequent childhood chronic diseases, showing also a prevalence increase in developed and developing countries, and similarly expected at UAE, this study designed to mapping childhood asthma in Dubai.

## 2. Objectives

To study the prevalence, clinical and epidemiological profile, and socio-demographic risk factors of childhood asthma in Dubai.

## 3. Methodology

This is a cross sectional study, conducted among students in

preparatory and secondary schools “Governmental and Private” in Dubai, U.A.E. Computer program EPI-Info version "6.04" was used for calculation of the minimum sample size required. According to a recent study<sup>(8)</sup> the prevalence of asthma among adolescent in the UAE was found to be 16%, using 3% degree of precision, 95% confidence interval and 1.5% design effect, the minimum sample size required was 855. A list of schools was obtained from the knowledge and Human Development Authority. Dubai includes 183 school spread along two large districts, Bur Dubai and Diera. Bur Dubai includes 90 schools, 69 private and 21 governmental, where Diera includes 93 schools, 72 private and 21 governmental. The numbers of students in preparatory and secondary stages are 42819 and 34299 respectively. Around 20289 of them in governmental schools, while 56829 are in private schools. This gives a total of 77118 students in both regions (private and governmental). A multistage stratified random sample was used. The strata were based upon geographical districts (Bur-Dubai and Diera), type of schools (governmental or private), educational grade (7<sup>th</sup> through 12<sup>th</sup>) and sex (males and females). The number of the governmental schools was less than that of private schools (42 and 141 respectively). According to the numbers of schools, a proportional allocation technique was used to determine the required sample size. A total of 16 private schools (8 from Bur Dubai and 8 from Diera), with 4 schools of boys and 4 schools of girls for each district were randomly selected. Also, 4 governmental schools (2 from Bur Dubai and 2 from Diera), with one school for each gender from each district were randomly selected. From each school one class was selected randomly from each educational grade. All the students in the selected classes were invited to participate in the study and all of them agreed to participate (response rate 100%). The total sample size reached 1639 students.

## 4. Results

Table (1) shows the prevalence of asthma among the school students. It showed that 16.7% have had an asthma attack at some point of time.

**Table (1).** Distribution of preparatory and secondary school students in Dubai according to asthma status, 2011.

Asthma status	No.	%
Asthmatic	273	16.7
Non asthmatic	1366	83.3
Total number of students	1639	100

In table (2) asthmatics were classified according to the age of onset of asthma attack, 38.5% had asthma at age of less than 3 years, 28.6% from 3 to less than 6 years, 19% from 6 to less than 9 years and only 13.9% at an age of 9 years or

more with a mean of  $5.0 \pm 2.9$  years.

**Table (2).** Distribution of asthmatic preparatory and secondary school students according to their age at onset of asthma (Dubai, 2011).

Age at onset of asthma (years)	No.	%
<3	105	38.5
3-	78	28.6
6-	52	19.0
9+	38	13.9
Total Number of Students	273	100

**Table (3).** Distribution of preparatory and secondary school students according to asthma symptoms (Dubai, 2011).

Symptom	No.	%
Wheezing ever*		
No	1366	83.3
Yes	273	16.7
Wheezing within the last 12 months**		
No	74	27.1
Yes	199	72.9
No. of attacks of wheezing within the last 12 months***		
No	16	8.0
1-	119	59.8
4-	47	23.6
>12	17	8.5
Frequency of asthma symptoms/week***		
≤ 2/week	98	49.2
< 2/week but not daily	62	31.2
Daily	22	11.1
Over the day	17	8.5
Sleep disturbance due to wheezing***		
No	91	45.7
less than 1/week	70	35.2
1 or more/week	38	19.1
Frequency of nocturnal symptoms***		
≤ 2/month	124	62.3
3-4 times/month	40	20.1
More than 1/week but not nightly	22	11.1
Frequent (often 7days/week)	13	6.5
Speech limitation due to wheezing***		
No	115	57.8
Yes	84	42.2
Wheezing during or after exercise***		
No	66	33.2
Yes	133	66.8
Rate of inhaler use***		
≤ 2/week	115	57.8
> 2/week but not daily	51	25.6
Daily	17	8.5
Several times/day	16	8.0

\*Number of students=1639

\*\* Number of asthmatic students=273

\*\*\*Number of students with asthma in the last 12 months=199

In table (3), most of the studied students had no wheezing or whistling in the chest at any time in the past (83.5%), and among the remaining students 72.9% had wheezes within the last 12 months. Amongst those who had wheezes in the last 12 months 59.8% had 1 to less than 4 attacks during this period, 23.6% had 4 to 12 attacks and 8.5% had more than 12 attacks. As regards the frequency of asthma symptoms per week it can be noted that 8.5% had the symptoms over the

day, another 11.1% had daily symptoms, 49.2% had the symptoms 2 times or less / week and another 31.2% had the symptoms frequency of more than 2 times / week but not daily. Regarding the sleeping it was disturbed less than once weekly in 35.2% while it was disturbed once or more per week in 19.1%. Studying the frequency of nocturnal symptoms; 6.5% had frequent nocturnal symptoms, 11.1% had these symptoms more than once per week, 20.1% experienced the nocturnal symptoms 3-4 times a month and the vast majority experienced the symptoms less than twice monthly. Speech limitation due to wheezing was reported by 42.2%, and 66.8% experienced wheezes during and after exercise. As regards using inhalers, the frequency of use ranged from less than or twice weekly in 57.8% and several times/ day in 8%, while it was used daily in 8.5% and used more than twice weekly in 25.6%.

**Table (4).** Prevalence of asthma among preparatory and secondary school students according to their demographic characteristics (Dubai, 2011).

Characteristic	Total (1639)	Non-asthmatic (1366)		Asthmatic (273)		OR (95%CI)
		No.	%	No.	%	
Age						
11-	433	374	84.4	69	15.6	1
13-	573	477	83.2	96	16.8	1.1 (0.78-1.5)
15-	560	465	83.0	95	17.0	1.1 (0.78-1.6)
17+	63	50	79.4	13	20.6	1.4 (0.73-2.7)
Sex						
Female	838	715	85.3	123	14.7	1
Male	801	651	81.3	150	18.8	1.3 (1.0-1.7)
Nationality						
Non Local	776	665	85.7	111	14.3	1
Local	863	701	81.2	162	18.8	1.4 (1.1-1.8)
School type						
Private	1264	1076	85.1	188	14.9	1
Governmental	375	290	77.3	85	22.7	1.7 (1.3-2.3)

Table (4) presents the prevalence of asthma among the studied preparatory and secondary school students according to their demographic characteristics. Considering the age of students, the prevalence of asthma was nearly equal among the different age groups with slight increase in the older age groups. As regards the sex the prevalence of asthma was 1.3 times higher among males compared to females and this was found to be statistically significant. The prevalence according to nationality was 1.4 times higher among locals compared to non-locals and 1.7 times higher among students in governmental than those in private school types and both were statistically significant.

Table (5) shows the parental education, crowding index and number of windows per room. It can be noted that as regards father education the highest prevalence of asthma was seen among students whose fathers were of lower education (illiterate 26.7%) as compared to those whose fathers were of university education (15.3%) with the exception of those in preparatory school (14.3%). Students whose fathers were secondary educated had a significant risk of 1.4 times more than those whose fathers were university educated and 2.1 times higher for those whose fathers were illiterate than those whose fathers were university educated. As for the mother education, it can be noted that with the exception of the illiterate group, the prevalence increased with decreased educational level of the mother however the risk was not significant. Crowding index showed no significant association with asthma. As regards the room ventilation (number of windows in the room), the prevalence was found to increase with the decrease of number of windows however this was not significant.

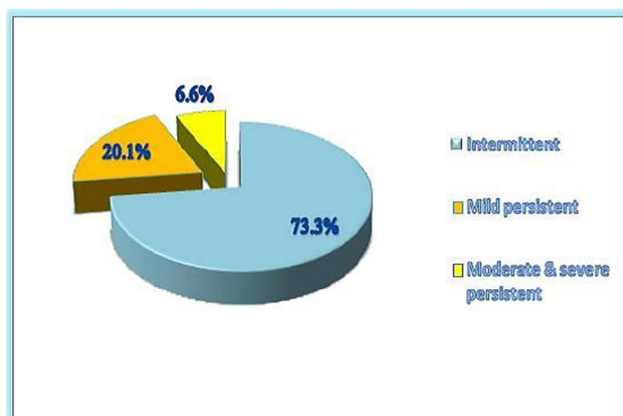
**Table (5).** Prevalence of asthma among preparatory and secondary school students according to their family and housing characteristics (Dubai, 2011).

Characteristic		Total (1639)	Non asthmatic (1366)		Asthmatic (273)		OR (95% CI)
			No.	%	No.	%	
Father's education level	University	1062	899	84.7	163	15.3	1
	Secondary	321	257	80.1	64	19.9	1.4 (1.0- 1.9)
	preparatory	133	114	85.7	19	14.3	0.9 (0.56- 1.5)
	Primary	78	63	80.8	15	19.2	1.3 (0.72- 2.4)
	Illiterate	45	33	73.3	12	26.7	2.1 (1.1- 4.0)
Mother's education level	University	855	715	83.6	140	16.4	1
	Secondary	424	358	84.4	66	15.6	1.0 (0.67- 1.3)
	preparatory	127	102	80.3	55	19.7	1.3 (0.77- 2.0)
	Primary	137	109	79.6	28	20.4	1.3 (0.83- 2.10)
	Illiterate	96	82	85.4	14	14.6	0.83 (0.48- 1.6)
Crowding index (person\ room)	<2	1209	998	82.5	211	17.5	1
	2-	412	353	85.7	59	14.3	0.74 (0.57- 1.1)
	5+	18	15	83.3	3	16.7	0.94 (0.17- 3.4)
No. of windows in room	No	62	55	88.7	7	11.3	1
	>2	307	258	84.0	49	16.0	1.5 (0.63- 3.4)
	≤2	1270	1053	82.9	217	17.1	1.6 (0.72- 3.6)

Figure (1) shows the distribution of asthmatic children according to the severity of asthma, it can be noted that 73.3% showed intermittent asthma, 20.1% were classified

as mild persistent asthma and only 6.6% were considered moderate and severe persistent asthma. However due to the small sample size among moderate and severe persistent asthma they were combined to the mild persistent asthma

group and thus asthmatic students were classified as with either intermittent or persistent asthma for subsequent analysis.



**Figure (1).** Distribution of asthmatic preparatory and secondary school students according to asthma severity in Dubai, 2011.

## 5. Discussions

Considering bronchial asthma, it was brought out that 16.7% of the study students have had an asthmatic attack at some point of time with ever complaining of chest wheeze where near three fourths of them complained of this wheeze during the past 12 months prior to the research. This was in compliance with another study done in Alain city in UAE 2009, where the prevalence of asthma was 16 % among group aged 13-19 years old.<sup>(8)</sup> Another two studies at the years 1994 and 2000 in the UAE among students aged 6-13 years old, showed that the prevalence of asthma was 13,6%<sup>(21)</sup> and 13 %<sup>(22)</sup> respectively.

When comparing with gulf and some other neighbor countries in the region, asthma prevalence was higher in State of Qatar (19.8%)<sup>(15)</sup> and Oman (20%)<sup>(17)</sup> while it was lower in Saudi Arabia (11.4%)<sup>(16)</sup> and Egypt (7.7 %).<sup>(14)</sup>

Although the prevalence of asthma was nearly equal among the different age groups, early onset of asthmatic attacks was clearly eminent among the study sample where 67.1% of them had their first attacks before six years old with a mean age of  $5.0 \pm 2.9$  years for onset of the first attacks. This result comes in consistence with another study done in China which showed that median age of onset of asthma symptoms was 3 years old with peak between 1 to 3 years and more than 90% of children had their onset of asthma before the age of 6 as in our study.<sup>(23)</sup>

Our study showed that the prevalence of persistent asthma among asthmatic students was higher among the older age groups with a very high significant elevated risk among students aged 17 years and older. This is in contrast with another case control study which was conducted in Baghdad among primary school children aged 6-12 years both showed

a decreasing in asthma severity by age.<sup>(24)</sup>

Although Boys had higher statistically significant propensity to acquire bronchial asthma, gender revealed no difference concerning severity. Our findings go in agreement with the study done in UAE<sup>(8)</sup> as males were significantly more often reporting asthma (17% vs. 14% among females). In another study done between ages 6-14 years old in Qatar, the prevalence of asthma and allergic rhinitis decreased with increasing age. There were statistically significant differences between sexes, males had more asthma, allergic rhinitis, and chest infections compared to females.<sup>(15)</sup> In other studies the pattern was found to be different where a female-to-male prevalence was at least 50:50.<sup>(25)</sup>

The studies done in UAE have proved that boys were more prone to get bronchial asthma in comparison with girls.<sup>(8,21)</sup> Higher exposure of males to outdoor allergens may partially explain these findings because male adolescents tend to spend most of their time outside home, as opposed to their less outgoing and often more culturally oriented female counterparts.

Emirian students and those in governmental schools were more affected with bronchial asthma. Again this was in consistence with Alain study 2009, where UAE nationality children were more affected than other nationalities.<sup>(8)</sup> In what is believed is, private schools are usually more careful in keeping the maintenance processes of the air conditioning systems and cleaning procedures of the classrooms and school environments, consequently keeping what is known as "Bronchial Asthma Friendly School Environment". Besides, locals usually prefer attaching their children to governmental schools.

Some parameters of socio-demographic characteristics were studied in relation to the development of bronchial asthma. Parent's education inconsistently seemed to affect the prevalence of bronchial asthma among their children. Although apparently higher among low educated mothers, illiterate fathers had statistically significant higher percentage of asthmatic children. More than half of the study students had parents with university degrees. This goes in consistence with another study done among children aged 6-7 years in Rome which showed that the prevalence of physician diagnosis of asthma increased as father's education decreased and the prevalence of severe asthma increased as both maternal and paternal educational levels decreased and lifetime hospitalization for asthma was strongly associated with both parental education.<sup>(26)</sup>

In parallel again with the case control study which was done in Iraq between years 2000-2002, which gave evidence that a low level of education among parents acted as a significant risk factor for development of asthma.<sup>(24)</sup> This finding was also



supported by many other studies as those done in Brazil, Turkey and Sri Lanka.<sup>(27-29)</sup>

With less educated families, there are adverse environmental factors such as tobacco smoking, crowding, bad nutrition and housing conditions. These factors will make children of less educated mothers and fathers more susceptible to aeroallergen in addition to less medical care.<sup>(24)</sup>

Concerning living conditions, there are doubts that highly likely they can affect the health status of people. Barker et al., (2002)<sup>(30)</sup> stated that although living conditions in adult life do not seem to be important, the reverse is true regarding children and young adults. In this study crowding index showed no significant association with development of bronchial asthma among the study students. Although non-significant, the prevalence of persistent asthma was higher among those living in houses with 5 persons or more per room in comparison with those living in houses with less than 2 persons and less than five persons per room. A case-control study in Iraq found that the crowding rate of >5 person was a significant risk factor for asthma development.<sup>(24)</sup> In our study, more than 70% of the study students were found to have homes with low crowding index.

As regards the room ventilation expressed by the number of windows in the room, the prevalence was found to increase with the decrease of number of windows, however this was not significant. In this study no clear relation could be detected between room ventilation and severity of bronchial asthma. These findings can simply be explained by the fact that Dubai is a very hot country during almost all the year with consequent total dependence of the people on air conditioning system. People cannot rely on windows as a source of natural ventilation due to the very hot and humid natural air. On the other hand, a case-control study which included 120 cases of asthmatic children and a doubled number of controls proved that absence of windows in living rooms was among factors associated with presence of symptoms of asthma.<sup>(31)</sup>

Although family history of asthma; allergies and obesity was not statistically significantly associated with asthma severity it was found that prevalence of asthma was higher among children with family history of bronchial asthma also it was among the factors that expressed a significant effect on developing bronchial asthma among children with around five times risk. A significant risk of developing asthma was elucidated among students with family history of asthma, allergies and obesity. About 19% of the study students had positive family history of asthma with almost one third of them recorded family history of different types of allergic disorders. This goes in agreement with Alain study<sup>(8)</sup> as the

family history of asthma was the strongest predictor of asthma. Another study in Iraq showed positive association between family history and asthma whether among father, or mother or sibling.<sup>(24)</sup> Again those finding are in consistent with many other studies elsewhere in the world.<sup>(27,32,33)</sup> The association between the risk of getting bronchial asthma and family history of obesity can be explained as both conditions caused by shared genetic risk factors.<sup>(34)</sup>

## 6. Conclusion

It was brought out that 16.7% of the study students have had an asthma attack at some point of time with ever complaining of chest wheeze where near three fourths of them complained of this wheeze during the past 12 months prior to the research. Early onset of asthmatic attacks was clearly eminent among the study sample where 67.1% of them had their first attacks before six years old with a mean age of  $5.0 \pm 2.9$  years for onset of the first attacks. Although Boys had higher statistically significant propensity to acquire bronchial asthma, gender revealed no difference concerning severity. Emirian students and those in governmental schools were more affected with bronchial asthma. Although apparently higher among low educated mothers, illiterate fathers had statistically significant higher percentage of asthmatic children.

## Recommendations

Develop a national asthma surveillance system for screening bronchial asthma among school children. This could have the advantages of early detection of cases in the pre-symptomatic stage especially at young age. This ensures no asthma cases are overlooked. Reduce socioeconomic disparities in childhood asthma outcomes. 2- Launch a national asthma public education campaign to: Improve asthma awareness among students, their families, school staff and the general public. Promote asthma-safe home environments. Promote asthma-friendly schools and school-based asthma programs.

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