

Prevalence of Bronchial Asthma and Its Association with Obesity and Overweight Among Adolescents in Dubai, UAE

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Abstract

Background: Asthma and obesity are recently evolved into two major public health concerns in developed countries. *Objectives:* The objective of this study was to measure the prevalence of bronchial asthma among preparatory and secondary school students in Dubai, and to study the association of bronchial asthma with overweight and obesity and some socio-demographic characteristics among preparatory and secondary school students in Dubai. *Methodology:* A cross sectional study was conducted among students of preparatory and secondary schools (private and governmental schools) in Dubai using a stratified random sample technique. The study sample included 1639 children. *Results:* 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. Emirian students and those in governmental schools were more affected with bronchial asthma. Obesity and overweight expressed as BMI were among factors associated with increase the prevalence of asthma among school students in preparatory and secondary schools abreast with family history of asthma and being male. *Conclusion:* Body weight and family history of bronchial asthma patients contribute significantly in the development of bronchial asthma. There is a need to develop a national asthma surveillance system for screening of bronchial asthma among school children, launching a national asthma public education campaigns, targeting childhood overweight and obesity and lunched a prospective study with a large sample size for further investigation of the relation-ship between asthma and childhood overweight and obesity.

Keywords

Bronchial Asthma, Obesity, Overweight, Dubai Students

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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. (1) Asthma and obesity are recently evolved into two major public health concerns in developed countries. (2) Asthma prevalence exists globally in wide variations. (3) It is the most common chronic disease facing the childhood in first world countries. Recurrent asthma-like symptoms were reported in proximately 32 percent of preschool children in

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the United States and Europe. (4) 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. (5) with approximately 500,000 hospitalizations per year and 13 million missed school days. (6) Asthma is the third-ranking cause of hospitalization among children under 15. (7)

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%. (8) On the other hand, obesity showed a marked increase over the last three decades. Childhood obesity has more than tripled in the past 30 years. In United States (U.S), the prevalence of obesity among children aged 6 to 11 years jumped from 6.5% in 1980 to 19.6% in 2008. Among adolescents aged 12 to 19 year, obesity has increased from 5.0% to 18.1% respectively. (9,10) In a study done in United Arab Emirates (UAE) in 2007 on 4381 children aged 5-17 years. The prevalence of overweight and obesity was (21.5% and 13.7%) respectively. More girls than boys were overweight. (11) This parallel increases in the prevalence of obesity and asthma suggests a possible association between both conditions. It has been recognized that obesity is more common among children with asthma. Many studies involving children and adults have observed associations between asthma and high body mass index BMI. Some studies have shown that with increasing BMI the relative risk of asthma was 2.3 in boys and 1.5 in girls respectively. Obesity is not only a risk factor for the development of asthma, but also it makes current asthma more severe. (12) Children with asthma have a chance of remission from their disease at puberty time. Obesity alters the natural history of the asthma and may prevent this remission; the pathophysiology behind that may be that the inflammatory state of obesity may superimpose that of asthma leading to alteration of natural history of childhood asthma. (13)

Most of the reviews show a relation between both asthma and obesity which are also a major public health conditions and threats. Both disorders may share common genetic and environmental causes. There are mechanical, developmental, hormonal, signal transduction, and immunologic reasons for their effects. (14) There seems to be a potential relationship between obesity and early dietary bad habits with bronchial asthma. Obesity may be significantly associated with or be a risk factor of bronchial asthma occurrence and severity

2. Objectives

To measure the prevalence of bronchial asthma among preparatory and secondary school students in Dubai. To study

the association between some socio-demographic characteristics of the study students and bronchial asthma prevalence and severity. To study the association between overweight/ obesity and bronchial asthma prevalence and severity among preparatory and secondary school students in Dubai.

3. Methodology

A cross sectional study was conducted among the minimum sample size of 855 students in preparatory and secondary schools “Governmental and Private” in Dubai, U.A.E. (males and females) Computer program EPI-Info version “6.04” was used for calculation of the minimum sample size required. 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. 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 (7th through 12th) 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. 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 valid and reliable questionnaire sheet was used to collect data including socio-demographic data, personal data (age, gender, grade (7th-12th), nationality, schools type (governmental and private), family history of bronchial asthma, obesity and allergy as (allergic rhinitis, eczema, sinusitis, food allergy), asthma symptoms, dietary habits: (Adolescent food habits checklist AFHC) was used to assess dietary habits and behaviors, Food habit scoring, (15) physical examination, and anthropometric data (height, weight and Body Mass Index).

Data were coded and entered into a computer and were analyzed using *SPSS* (version 19). students as well as between students with intermittent and persistent asthma. For all descriptive and analytic statistics the 5% level was chosen as the level of significance. (16)

4. Results

Table (1) presents the prevalence of asthma according to the family history of asthma and obesity in Dubai 2011. The prevalence of asthma was higher among those with family history of asthma (39.5%) as compared to those with no family history (11.2%) and this yielded a significant risk of 5.2 times more among those with family history of asthma. A significant risk of developing asthma can also be noted among those with family history of allergies (1.5 times) and those with family history of obesity (1.8 times).

Table (1). Prevalence of asthma among preparatory and secondary school students according to their family history of asthma and obesity (Dubai, 2011).

Family history		Total (1639)	Non Asthmatic (n=1366)		Asthmatic (n=273)		OR (95%CI)
			No.	%	No.	%	
			Family history of asthma	No	1325	1176	
	Yes	314	190	60.5	124	39.5	5.2 (3.9-6.8)
Family history of allergies	No	1097	935	85.2	162	14.8	1
	Yes	542	431	79.5	111	20.5	1.5 (1.1-1.9)
Family history of obesity	No	1293	1101	85.2	192	14.8	1
	Yes	346	265	76.6	81	23.4	1.8 (1.3-2.3)

Table (2) shows that by further analysis it was revealed that family history of asthma, allergies and obesity were not statistically significantly associated with asthma severity table.

Table (3) presents the prevalence of asthma according to the body mass index percentile classification. It can be shown that overweight students have 1.8 times the risk to develop asthma than those who are normal/underweight while obese

Table (4). Prevalence of asthma among preparatory and secondary school students according to their sex and body mass index percentile classification (Dubai, 2011).

BMI		Total (1639)	Non Asthmatic (n=1366)		Asthmatic (n=273)		OR (95%CI)
			No.	%	No.	%	
Female	Normal/Underweight	666	576	86.5	90	13.5	1
	Overweight	117	92	78.6	25	21.4	1.7 (1.01-2.90)
	Obese	55	47	85.5	8	14.5	1.1 (0.43-2.4)
Male	Normal/Underweight	501	429	85.6	72	14.4	1
	Overweight	145	111	76.6	34	23.4	1.84 (1.11-2.94)
	Obese	155	111	71.6	44	28.4	2.4 (1.5-3.6)

Table (5) shows the relationship between body mass index percentiles classification and asthma symptoms among asthmatic students. It can be noted that the percentage of

students have 2.1 times more risk and this was found to be statistically significant

Table (2). Severity of bronchial asthma among asthmatic preparatory and secondary school students according to their family history of asthma, allergies and obesity (Dubai, 2011).

Family history		Total (273)	Intermittent (n=200)		Persistent (n=73)		OR (95%CI)
			No.	%	No.	%	
Family history of asthma	No	149	108	72.5	41	27.5	1
	Yes	124	92	74.2	32	25.8	0.92 (0.53-1.6)
Family history of allergies	No	162	118	72.8	44	27.2	1
	Yes	111	82	73.9	29	26.1	0.95 (0.55-1.6)
Family history of obesity	No	192	139	72.4	53	27.6	1
	Yes	81	61	75.3	20	24.7	0.86 (0.47-1.6)

Table (3). Prevalence of asthma among preparatory and secondary school students according to their Body mass index percentile classification (Dubai, 2011).

BMI		Total (1639)	Non Asthmatic (n=1366)		Asthmatic (n=273)		OR (95%CI)
			No.	%	No.	%	
Normal/Underweight		1167	1005	86.1	162	13.9	1
	Overweight	262	203	77.5	59	22.5	1.8 (1.3-2.5)
Obese		210	158	75.2	52	24.8	2.1 (1.4-2.9)

Table (4) presents the prevalence of asthma according to the body mass index percentile classification stratified by sex. Among females those who were overweight had 1.7 times the risk to develop asthma compared to normal/underweight and this was found to be statistically significant, while those who were obese had 1.1 times the risk but this was not statistically significant. Among the males it can be noted that the risk of developing asthma increases with increased level of obesity, it was 1.84 times more among those who were overweight as compared to those who were normal/underweight and 2.4 times more for the obese students and both were found to be statistically significant.

asthmatic students with current wheezing (wheezes in the last 12 months) increased with increasing level of obesity (68.1%, 78% and 82.4% in normal/underweight, overweight and obese students respectively), however it

was not found to be statistically significant. Studying the number of wheezes attacks within the last 12 months. It can be noted that for each of the different number of attacks categories there was a trend of increase in the percentage of students with the increase in the obesity level, where there were 4-12 attacks among 35.7% obese students compared to, 26.1% among overweight students and 18% among normal/underweight, while there was >12 attacks among 16.7% obese students compared to 6.5% among overweight students and 6.3% among normal students and this increase was found to be statistically significant. The same pattern was also noted in the frequency of asthma symptoms where our analysis showed that daily frequency of asthma symptoms was found among 26.2% obese students compared to 6.5% overweight students and 7.2% normal students while 9.5% of obese students had asthma symptoms over the day compared to 8.7% overweight and 8.1% normal and this was also statistically significant. Sleeping disturbance due to wheezing among asthmatic students with current wheezing was also studied and revealed that as the level of obesity increases there is an increase in the sleeping disturbance percentage among obese students (23.8% for 1 or more/week) compared to overweight (21.7%) and normal students (16.2%) but this was not

found to be statistically significant ($p=0.407$). The same pattern was also noted in the frequency of nocturnal symptoms among students with current wheezing where the percentage also increased with the increase in level of obesity for example 9.5% of obese students had frequent nocturnal symptoms compared to 8.7% overweight students and 4.5% normal students and 14.3% of obese students had this symptom more than 1/week compared to 10.9% overweight and 9.9% normal but the difference was not statistically significant. Studying the speech limitation due to wheezes showed no statistical significant association with body mass index There was also no statistical significant association between wheezing during and after exercise and obesity yet those who suffered from wheezes during or after exercise were more among obese (76.2%) than in overweight (67.4%) and in normal (63.1%). The role of inhalers use was also studied and revealed that for the different categories of inhaler use the more the level of obesity the more the percentage of students where daily inhaler use and use for several times /day among obese students amounted to 14.3 % and 11.9% respectively compared to 8.7% and 6.5% among overweight and 6.3% and 7.2% among normal students however the association was not significant ($p=0.672$).

Table (5). Relation between BMI percentile classification of asthmatic preparatory and secondary school students and asthma symptoms (Dubai, 2011).

Symptom		Total	Normal		Overweight		Obese		P value*
			No.	%	No.	%	No.	%	
Wheezing within the last 12 months ++	No	74	52	31.9	13	22.0	9	17.6	0.113
	Yes	199	111	68.1	46	78.0	42	82.4	
No. of attacks of wheezing within the last 12 months+++	No	16	10	9.0	5	10.9	1	2.4	0.046
	1-	119	74	66.7	26	56.5	19	45.2	
	4-	47	20	18.0	12	26.1	15	35.7	
	> 12	17	7	6.3	3	6.5	7	16.7	
	≤ 2/week	98	59	53.2	25	54.3	14	33.3	
Frequency of asthma symptoms+++	> 2/week but not daily	62	35	31.5	14	30.4	13	31.0	0.407
	Daily	22	8	7.2	3	6.5	11	26.2	
	Over the day	17	9	8.1	4	8.7	4	9.5	
	No	91	56	50.5	21	45.7	14	33.3	
Sleep isturbance due to wheezing+++	< 1/week	70	37	33.3	15	32.6	18	42.9	0.401
	1 or more /week	38	18	16.2	10	21.7	10	23.8	
	≤ 2/month	124	76	68.5	28	60.9	20	47.6	
Frequency of nocturnal symptoms+++	3-4 time /month	40	19	17.1	9	19.6	12	28.6	0.097
	≥ 1/week but not nightly	22	11	9.9	5	10.9	6	14.3	
	Frequent (often 7 days/week)	13	5	4.5	4	8.7	4	9.5	
Speech limitation due to wheezing+++	No	115	71	64.0	21	45.7	23	54.8	0.305
	Yes	84	40	36.0	25	54.3	19	45.2	
Wheezing during or after exercise+++	No	66	41	36.9	15	32.6	10	23.8	0.672
	Yes	133	70	63.1	31	67.4	32	76.2	
Rate of inhaler use+++	≤ 2/week	115	65	58.6	28	60.9	22	52.4	0.672
	> 2/week but not daily	51	31	27.9	11	23.9	9	21.4	
	Daily	17	7	6.3	4	8.7	6	14.3	
	Several times/day	16	8	7.2	3	6.5	5	11.9	

* $P < 0.05$ (significant P based on chi squared test or Monte Carlo exact test where appropriate)

++ Number of students=273

+++ Number of students=199

Table (6) shows the prevalence of persistent asthma according to the body mass index percentile for age. No clear patterns of risks were observed where the prevalence of persistent asthma among all BMI categories were almost equal (27.8%, 25.4% and 25%).

Table (6). Severity of bronchial asthma among asthmatic preparatory and secondary school students according to their Body mass index percentile classification (Dubai, 2011).

BMI	Total (273)	Intermittent (n=200)		Persistent (n=73)		OR (95%CI)
		No.	%	No.	%	
Normal/Underweight	162	117	72.2	45	27.8	1
Overweight	59	44	74.6	15	25.4	0.89 (0.45-1.7)
Obese	52	39	75.0	13	25.0	0.87 (0.42-1.8)

Table (7) presents the prevalence of asthma according to the AFHC score. The prevalence of asthma was higher among those who had a low AFHC score as compared to those with a high score (17% and 13.5% respectively), the same pattern was seen among those with medium AFHC score (16.6%) however the risk was not statistically significant. Results were confirmed by considering AFHC score as a continuous variable where when the mean AFHC score among asthmatics (10.6 ± 4.2) was compared with the mean score among non-asthmatics (10.8 ± 4.3) the difference was also found to be non-significant.

Table (7). Prevalence of asthma among preparatory and secondary school students according to their AFHC score (Dubai, 2011).

AFHC Score	Total (1639)	Non Asthmatic (n=1366)		Asthmatic (n=273)		OR (95%CI)
		No.	%	No.	%	
High	89	77	86.5	12	13.5	1
Medium	650	542	83.4	108	16.6	1.2 (0.67-2.4)
Low	900	747	83.0	153	17.0	1.3 (0.69-2.5)
<i>X ± SD</i>		10.8 ± 4.3		10.6 ± 4.2		P=0.295*

* p value based on independent t test

Table (8). Severity of bronchial asthma among asthmatic preparatory and secondary school students according to their AFHC score (Dubai, 2011).

AFHC Score	Total (273)	Intermittent (n=200)		Persistent (n=73)		OR (95%CI)
		No.	%	No.	%	
High	12	7	58.3	5	41.7	1
Medium	108	83	76.9	25	23.1	0.42 (0.12-1.4)
Low	153	110	71.9	43	28.1	0.55 (0.17- 1.8)
<i>X ± SD</i>		10.8 ± 4.2		10.4 ± 4.4		P=0.545*

+ p value based on independent t test

Table (8) shows that there was no evidence that the risk of persistent asthma was associated with the AFHC score. The mean AFHC score among intermittent asthmatics (10.8 ± 4.2) was compared with the mean score among persistent

asthmatics (10.4 ± 4.4) the difference was also found to be non-significant (t=0.606, p=0.545).

Table (9) shows the results of stepwise logistic regression analysis for factors related to asthma which revealed that three factors were significantly related to prevalence of asthma. Family history of asthma was the most significant factor related to prevalence of asthma where students with family history of asthma had 5.4 times the risk in the development of asthma compared to those who had no family history. This was followed by being a male, as it increased the risk of getting asthma to 1.4 followed by the level of obesity where obese students had 2.0 times the risk to develop asthma compared to normal/underweight students, and overweight where the adjusted risk amounted to 1.7 times more than normal/underweight students. Lastly students in governmental schools were 1.6 times more likely to develop asthma as compared to those in private schools.

Table (9). Results of stepwise logistic regression for factors related to asthma prevalence.

Factor		B	SE	Adjusted OR	95% CI	
					LCL	UCL
Family history of asthma	Yes	1.67	0.15	5.4	4.0	7.2
Gender	Male	0.33	0.15	1.4	1.1	1.9
BMI classification	Overweight	0.55	0.18	1.7	1.2	2.5
	Obese	0.69	0.19	2.0	1.4	2.9
School Type	Governmental	0.45	0.16	1.6	1.2	2.1

5. Discussions

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⁽⁸⁾ 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.⁽¹⁷⁾ Again those finding are in consistent with many other studies elsewhere in the world.^(18,19,20) 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.⁽²¹⁾

The relation between bronchial asthma and weight of the study students was also investigated. Based on the results of stepwise logistic regression analysis, obesity was an important contributing factor abreast with other factors that were significantly related to the prevalence of asthma namely family history of asthma and being a governmental school student.

In this study according to percentile classification it was shown that, 16% of the study students were overweight while 12.8% were obese. Overweight and obese students were found to have almost doubled risk of developing asthma compared with those who are normal/underweight. Body mass index percentile classification proved that in comparison with normal/underweight students, their overweight and obese male and female counterparts had higher risk of developing bronchial asthma. On the other hand BMI revealed no relation with severity of asthma in this study. The relationship between body mass index percentiles classification and asthma symptoms among asthmatic students was clear. It can be noted that the percentage of asthmatic students with current wheezing (wheezes in the last 12 months) increased with increasing level of obesity (68.9%, 78% and 82.4% in normal/underweight, overweight and obese students respectively), however it was found to be statistically insignificant. On the other hand, body weight revealed a statistical significant relation with some trends of asthmatic attacks. Those who had more than four attacks of wheeze within the last 12 months were more prevalent among overweight than obese students respectively in comparison to normal weight students. Same finding was found regards the frequency of asthma symptoms where it was found that the more the weight of the student the more the frequency of asthma attacks, the differences were statistically significant. Sleeping disturbances or speech limitation due to wheezing, and frequency of nocturnal symptoms, wheezing during or after exercise and rate of inhaler use were all apparently higher among obese and overweight asthmatic children.

This goes with another study done in Iran, on a total of 903 children, 7 to 11 years of age, through cluster sampling where they applied the International Study of Asthma and Allergies in Childhood (ISAAC) questionnaire. It showed that the prevalence of wheezing among obese and overweight children was 68.75% and 37%, respectively and showed that obese and overweight children had significantly higher prevalence of current wheezing than children of normal weight.⁽²²⁾

Another study was done in Southern California to determine the relation between obesity and new-onset asthma among

school children aged 7 to 18 years at time of study entry, through a longitudinal data which examined 3792 participants who were asthma-free at enrollment. New cases of physician-diagnosed asthma, height, weight, lung function, and risk factors for asthma were assessed annually at five school visits between 1993 and 1998. The risk of new onset asthma was higher among children who were overweight. Boys had an increased risk associated with being overweight in comparison with girls.⁽²³⁾

Again in Brazil and in 2005 a cross sectional study was done to investigate the relationship between the increase of body mass index and the prevalence and severity of asthma. The study recruited 4010 schoolchildren aged 13 and 14 years. The International Study of Asthma and Allergies in Childhood (ISAAC) phase III was used. Results showed a significant statistical association between the increase in body mass index and the prevalence of wheezing ever, and wheezing with exercise and when stratified by sex, there was a positive association just for wheezing ever for boys and wheezing with exercise for girls.⁽²⁴⁾ Overall, the relation between obesity/overweight and bronchial asthma has been examined and proved in many studies involving older age groups also.⁽²⁵⁻²⁷⁾

Dietary habits in relation to bronchial asthma were studied. The Adolescent Food Habits Checklist (AFHC) is a tool to measure the healthy eating habits designed specifically for use with adolescents. The AFHC refers to food choice situations in which adolescents are likely to have a degree of personal control. Furthermore, the AFHC focuses specifically on areas of the adolescent diet which present cause for concern, particularly the consumption of energy dense foods and fruit and vegetable intake. Items of this checklist were generated by dietitians and health psychologists. Unsound eating habits contribute to health problems. They tend to be established early in life, and young people who have unhealthy eating habits tend to maintain these habits as they age.⁽²⁸⁾

It was proved that more than half of the study sample recorded low score AFHC with mean value of 10.8 ± 4.3 which means bad dietary habits. Although the mean AFHC scores revealed no statistical significant difference in concern with prevalence or severity of asthma but, the prevalence was apparently higher among those who had a low or medium AFHC score as compared to those with a high score however the risk was not statistically significant.

Associations between an unhealthy diet and overweight and the presence of asthma were reported. The high prevalence of childhood asthma in „western societies“ cannot be explained by genetic background alone and is thus likely to be associated with environment as well as lifestyle. Less

physical activity and a dietary change may contribute to the recent increase in asthma and atopy.⁽²⁹⁾

There is an evidence that a high level of unsaturated fatty acid dietary intake is related to an increase in prevalence of asthma and chronic obstructive pulmonary disease (COPD). It has been hypothesized that the increase in asthma may, in part, be a consequence of changing diet, and early life dietary exposures might be particularly important in the development of childhood asthma. It is well known that changes in dietary habits, such as increasing salt intake, and decreasing intake of fruit and vegetables, contribute to the rise in asthma and COPD mortality and morbidity.⁽³⁰⁾

The Mediterranean diet is healthy eating pattern with protective effects on chronic diseases. It represents a set of healthy dietary habits including high consumption of vegetables and fresh fruits, with olive oil as the main source of fat.⁽³¹⁾ The effect of this healthy diet was examined in a cross sectional study done in Portugal including 174 asthmatics where it showed that high adherence to Mediterranean diet reduced 78% the risk of non-controlled asthma after adjusting for gender, age, education, inhaled corticosteroids and energy intake.⁽³²⁾

Stepwise logistic regression analysis of the results of this study proved that obesity and overweight expressed as BMI were among the risk factors to increase the prevalence of asthma among preparatory and secondary school students abreast with family history of asthma and being a male student. Also, those in governmental schools were found to have higher risk of developing bronchial asthma in comparison with students in private schools.

Ultimately, bronchial asthma frequently starts in early childhood, but it is very difficult to diagnose in this age group. Symptom history still forms the basis for defining asthma in both clinical and epidemiological settings. Bronchial hyper-responsiveness (BHR) tests only marginally increased the diagnostic accuracy after symptom history had been taken into account. The diagnosis of childhood asthma should not therefore be overlooked in symptomatic cases with no objective evidence of BHR. Moreover, BHR should not be required for defining asthma in epidemiological studies.⁽³³⁾

As was stated before, there is a parallel increase in the prevalence of obesity and asthma suggesting an association between both conditions as well as the relative risk of asthma may increase with increased BMI. Moreover, some of the studies in obese asthmatics have tried to find out which disease came first: asthma or obesity? This question remains unclear, but the reciprocal impact of both is evident. Several evident biologic mechanisms exist between asthma and obesity, leading to both direct or indirect association.⁽³⁴⁾

6. Conclusions

Overweight and obese students were found to have almost doubled risk of developing asthma compared with those who are normal/underweight. Body mass index percentile classification proved that in comparison with normal/underweight students, their overweight and obese male and female counterparts had higher risk of developing bronchial asthma. More than half of the study sample recorded low score AFHC with mean value of 10.8±4.3. The prevalence of bronchial asthma was apparently higher among those who have family history. Targeting childhood obesity and incorporating weight reduction strategies in efforts to reduce the health burden of asthma by decreasing its prevalence and severity and improves the disease control and quality of life in asthmatic patients. There is a need for developing a national asthma surveillance system for screening of bronchial asthma among school children, launching a national asthma public education campaigns, targeting childhood overweight and obesity, enforcing tobacco control strategies and launching a prospective study with a large sample size for further investigation of the relationship between asthma and childhood overweight and obesity.

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