Relation between severity of bronchial asthmaandbody composition parameters in obese asthmatic children

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Abstract

Background: Obesity and asthma in children are both increasing concomitantly with serious effects on health and quality of life. Obesity worsens the severity of asthma symptoms. Both, asthma and obesity have serious health consequences and significant financial costs. Assessment of body composition is important in understanding the relationship between obesity and asthma.

Aim: This study was designed to evaluate body composition parameters in both obese and non-obeseasthmatic children and their effect on severity of asthma symptoms.

Methods: A cross-sectional case-control study included 90 children divided into 3 equal groups including both males and females with an age range of (7- 12) years; 30 non-obese asthmatics, 30 obese asthmatics from children attending allergy clinic at Abu-El Rish Pediatric Hospital, and 30 healthy controls. Complete history, clinical examination, anthropometric measurements; including: height, weight and body mass index, and body composition parameters including: fat mass, fat free mass, fat %, total body water, impedance and basal metabolic rate were taken.

Results: Prevalence of both asthma and obesity was more among males with a male to female ratio= 2: 1. Non-obese asthmatics were classified into 76.7% mild and 23.3% moderate cases. The obese asthmatics were classified into 30% mild, 60% moderate and 10% severe cases. The obese asthmatic group showed highly statistically significant differences compared to the non-obese asthmatic group: P< 0.005 regarding: weight, BMI, FM, FFM, IMP, TBW, BMR and in Fat% P< 0.05. The obese asthmatic group showed statistically significant differences compared to the control regardingweight, BMI, FM, FFM, IMP, TBW, BMR with (P< 0.005) and in the Fat% with (P<0.05).

Conclusion: Obesity aggravates the severity of asthma and body composition plays an important role as well.

Keywords: Asthma, Obesity, Children, Body Composition.

العلاقة بين شدة الربو الشعبى ومعلمات تكوين الجسم في الاطفال البدناء المصابين بالربو

الخلفية: السمنة والربو في الأطفال على السواء تتزايد في الوقت ذاته مع آثار خطيرة على الصحة ونوعية الحياة. السمنة تؤدي إلى تفاقم شدة أعراض الربو. تقييم تكوين الجسم مهم في فهم العلاقة بين السمنة والربو.

الهدف: تقييم معلمات تكوين الجسم في الأطفال المصابين بالربو وأثرها على شدة الربو.

الأساليب: دراسة حالة لمراقبة مستعرضة شملت ٣ مجموعات؛ ٣٠ من الأطفال غير البدناء المصابين بالربو، ٣٠ من البدناء المصابين بالربو الذين يترددون على عيادة الحساسية في مستشفى الأطفال أبو الريش، و٣٠ مجموعة ضابطة. تم أخذ التاريخ الكامل والفحص السريري والقياسات الانثروبومترية ومعلمات تكوين الجسم.

النتائج: كان انتشار الربو والسمنة أكثر بين الذكور مع نسبة الذكور إلى الإناث = ١: ٢. غير البدناء المصابين بالربو صنف واحسب شدة الربو إلى: ٧٦,٧% خفيفة و٢٣,٣% من الحالات المعتدلة. البدناء المصابون بالربو صنفوا إلي ٣٠% خفيفة و٦٠% متوسطة و ١٠% من الحالات الشديدة.

مجموعة البدناء المصابون بالربوأظهرت اختلافات دالة إحصائيا مقارنة بمجموعة الربو غير البدناء (p< 0.005) بشأن: الوزن، مؤشر كتلة الجسم، ، كتلة الدهون، الكتلة الخالية من الدهون، المقاومة، ماء الجسم الكلى و معدل الأيض أما نسبة الدهون (p< 0.05). مجموعة الربو البدناء أظهرت فروقاً دالة إحصائيا مقارنة بالمجموعة الضابطة فيما يتعلق بالوزن، مؤشر كتلة الجسم، كتلة الدهون ، الكتلة الخالية من الدهون ، المقاومة ، ماء الجسم الكلى، ومعدل الأيض (p< 0.005) وفي نسبة الدهون مع (p< 0.05).

الاستنتاج: السمنة تؤدي إلى تفاقم شدة الربو.

الكلمات المفتاحية: الربو الشعبى–السمنة–الأطفال–التكوين الجسمى.

Introduction:

Obesity and asthma are significant public health problems, both with increasing prevalence in children. (National Heart, Lung and Blood Institute, 2012).

Several epidemiological studies have shown that the prevalence of bronchial asthma and obesity is increasing concomitantly worldwide among children and young adults (Ford, 2005).

Both asthma and obesity have serious health consequences and significant financial costs. The burden of obesity on pulmonary function in children is highlighted by the increased frequency of bronchial hyper- responsiveness, increased number of prescribed medications and inhaled corticosteroid (ICS) use, and reduced peak expiratory flow rate in overweight/ obese asthmatic children compared to non- overweight asthmatic children (Luder et.al., 1998). Excess body weight is also associated with an increase in the number of school days missed by asthmatic children and significantly reduced quality of life (van Gent et.al., 2007).

Aim:

Aim of the present study was toevaluate body composition parameters in obese and non- obese asthmatic children andtheir effect on asthma severity.

Subjects And Methods:

The present study was conducted on 60 children from those attending the allergy clinic in Abo El Rish Pediatric Hospital, faculty of medicine, Cairo University during the period between 2013 and 2014. Their ages ranged from (7- 12) years.

Cases were divided into 2 groups; group1comprised 30 non- obese asthmatic children and group 2 comprised 30 obese asthmatic children. Another 30 apparently healthy children of matched age and sex were selected from siblings and relatives of the asthma cases. They were studied as the control group, group 3.

Inclusion criteria included both males and females with age range 7- 12 years from diagnosed cases of bronchial asthma either new cases or on treatment with corticosteroids for less than 3 months. BMI< 85th percentile were considered non- obese and BMI ≥95th percentile were considered obese children.

Children with any acute disease including upper or lower respiratory tract infections, any chronic disease (heart, liver, kidney diseases and endocrinal disorders) and Cases of asthma on corticosteroid therapy for more than 3 months were excluded from the study.

All cases included in the study were subjected to complete medicalhistory and thorough clinicalexamination. Anthropometric measurement in the form of height, weight and body composition (measured by Tanita body composition analyzer), which includedfat mass, fat free mass, percent fat, BMR, impedance andtotal body water. All measurements were made according to techniques described in the anthropometric standardization reference manual (Thuijls et.al., 2011). Children were weighed (in kg) using a calibrated Seca scale to the nearest0.1 kg (Seca, Hamburg, Germany), while height (in cm) was measured using a Seca 225 stadiometer to the nearest0.1 cm with the children dressed in minimal clothes, and without shoes. Each measurement was taken as the mean of three consecutive readings following the recommendations of the International Biological program (Iturriza-Gomaraet.al., 2004).

Statistical Analysis:

Data were collected, revised, coded and entered to the Statistical Package for Social Science (IBM SPSS) version 21. Qualitative data were presented as number and percentage. Quantitative data were presented as mean± standard deviation and the comparison between two independent groups with quantitative data were evaluated using 2- tailed unpaired t- test. Pearson's correlation coefficients were used to evaluate correlations between the data exhibiting parametric distribution. The p- value was considered significant at P< 0.05 and p< 0.005 was considered of highly significant difference.

Results:

Table (1) shows the demographic data of studied groups. The age of the obese asthmatics ranged between 7- 12 years with a mean age of 9.5± 1.6 years.

Distribution of asthmatic cases according to the severity of asthma is shown in table (2). Non- obese asthmatic cases were classified into 23 mild cases (76.7%) and 7 moderate cases (23.3%). The obese asthmatic cases were classified into 9 mild cases (30%), 18 moderate cases (60%) and 3 severe cases (10%).

Table (3) shows the anthropometric parameters of the studied asthmatic obese versus non- obese and control. The obese asthmatic group showed highly statistically significant differences regarding weight, BMI, FM, FFM, IMP, TBW and BMR (P< 0.005),a nd a significant difference regarding Fat% (P< 0.05). However, the height showed no statistically significant difference between the three studied groups (P>0.05). No statistically significant differences were found between non- obese asthmatic cases and the control group as regards the anthropometric data.

Correlation between the severity of asthma and the body composition parameters in obese asthmatic cases is shown in table (4). In obese asthmatics, positive significant correlations were found between severity of asthma and weight (p< 0.05), BMI (p< 0.005), FFM (p< 0.005), and BMR in K Cal (p= 0.007). Negative significant correlation was found between severity of asthma and the impedance (p< 0.005).

Table (1) Demographic data of studied groups

		Non Obese Asthmatic	Obese Asthmatics	Control
Age (in years)		8.9± 1.6	9.5± 1.6	8.8± 1.6
Sex	Male	20 (66.7%)	19 (63.3%)	11 (36.7%)
	Female	10 (33.3%)	11 (36.7%)	19 (63.3%)

Table (2) Distribution of cases according to the severity of asthma

Severity	Non- Obese Asthmatics		Obese Asthmatics	
	No.	%	No.	%
Mild	23	76.7%	9	30%
Moderate	7	23.3%	18	60%
Severe	-	-	3	10%

Table (3) Anthropometric data of studied asthmatic cases versus control

	Obese Asthmatics	Non- Obese Asthmatics	Control
Height (Cm)	136.5± 10.1	133.5± 10.1	133.7± 10.6
Weight (Kg)	57.7*± 9.1	31.6± 8.7	30.5± 8.3
BMI (Kg/m2)	30.8*±0.8	17.4±2.9	16.6±2.0
Fat%	52.5°±77.7	17.5±7.2	17.6±6.2
Fm (Kg)	20.8*±6.4	5.9±3.7	5.7±3.1
Ffm (Kg)	32.3*±8.7	25.9±6.3	24.8±5.8
Imp (()	501.5*±58.4	606.8±72.1	624.5±72.7
Tbw (Kg)	23.7*±6.3	19.0±4.7	18.1±4.3
Bmr (Kc)	1524.9*±287.2	1175.6±167.5	1139.0±133.0

(*) Highly significant statistical difference (p< 0.005) comparing obese asthmatic with non-obese asthmatic children and control group, (°)Significant statistical difference (p< 0.05) comparing obese asthmatic with non- obese asthmatic children and control group

Table (4) Correlation between the severity of asthmaand the body composition parameters in obese asthmatic cases

Body Composition Parameter		Severity Of Asthma
Weight	r	0.441
	p	0.015
BMI	r	0.615
	P	0.000
Fat%	r	-0.218
	p	0.248
Fat Mass	r	0.114
	p	0.547
FFM	r	0.556
	p	0.001
Impedance	r	-0.606
	p	0.000
BMR (Kcal)	r	0.483
	p	0.007

R: Pearson's Correlation Coefficient

Discussion:

Obesity and asthma are major public health problems affecting large numbers of individuals across the globe (National Heart, Lung and Blood Institute, 2012).

Accurate assessment of body fatness may be important in understanding the relationship between obesity and asthma (Shore et.al, 2005).

The present study revealed that the prevalence of both asthma and obesity was more among males with a male to female ratio= 2: 1.

In an Egyptian study done by Alameldin et.al., in 2012 on asthmatic students, 55.4% of them were males and 44.6% females with ages ranging from (13 to 17) Years.

Also in concordance with our results, Mansour et.al., in 2014 found that asthma was more prevalent among males (11.5%), compared to (7.1%) among females.

In the present study, severity of asthma was assessed according to the frequency of symptoms and exacerbations, nocturnal symptoms and limitation of activity. Non- obese asthmatics were classified into 76.7% mild and 23.3% moderate cases. The obese asthmatics were classified into 30% mild, 60% moderate and 10% severe cases. This indicates that obesity worsens asthma symptoms and the asthmatics' quality of life.

In agreement with ourfindings, Mosen et.al in a study in 2008 on patients with persistent asthma, found that obese individuals were significantly more likely than those with normal BMI to report worse asthma- related quality of life, worse asthma control, and more asthma- related hospitalization.

In the present study results regarding anthropometric and body composition parameters, the obese asthmatic group showed highly statistically significant differences compared to, the non- obese asthmatic group (P< 0.005) regarding weight, BMI, Fat%, FM, FFM, IMP, TBW, BMR. However, the height showed no statistically significant difference between the two studied asthmatic groups (P>0.05).

A linear relationship between asthma severity and BMI has been proposed (Akerman et.al, 2004 andVarraso et.al, 2005).

Boussoffara et.al., in 2014 compared obese and non- obese adult asthmatic patients but did not find a significant difference in the severity of asthma.

However, Michelson et.al., in 2009, in a cohort retrospective analysis found that elevated BMI z scores were associated with worse asthma severity.

Matusik et.al in 2015, made a comparison between obese and sport-trained children which revealed strong significant differences between the groups concerning all anthropometrical variables; weight, BMI □- score, FAT (%), BMR, FFM (%),T BW (%) and BMR (kJ/kg).

Although results of the present study revealed no statistically significant differences between non- obese asthmatic cases and the control group regarding height, this could be attributed to the inclusion criteria that were followed in recruiting new asthmatic cases with less than 3 months duration of treatment with corticosteroids.

In agreement with the present findings, Antonio et.al in 2004 in a study done on asthmatic children stated that there were no differences among patients and the controls in the distribution of the z- scores for weight/age, height/age and body mass index.

However in contradiction to the present findings, Varekova et.al in 2013 found that the body height was significantly lower in asthmatic boys than in the non- asthmatic. The present study results revealed that obese asthmatic group showed statistically significant differences compared to the control regarding: weight, BMI, FM, FFM, IMP, TBW, BMR with p< 0.005 and in the Fat% with P< 0.05. However, the height showed no statistically significant difference between the two groups.

In agreement with the present findings, in a study done by Vahlkvist et.al in 2009, obese asthmatic children had a higher body per cent fat than healthy controls.

This study revealed positive significant correlations among obese asthmatics between severity of asthma and weight (p< 0.05), BMI (p< 0.005), FFM (p< 0.005), and BMR in K Cal (p= 0.007). Negative significant correlation was found between severity of asthma and the impedance (p< 0.005).

In a study by Vangeepuram et.al., in 2011, higher body mass index percentile and percent body fat were associated with more physician diagnosed asthma which goes along with our study and implies that adipose tissue directly affects the airways.

Conclusion:

In conclusion, obesity aggravates the severity of asthma through body composition parameters which verifies that adipose tissue directly affects the airways. Further studies of other variables related to obesity which also affect severity of asthma are recommended.

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