

- [13] Libert N, Scherier S, Dubost C, et al. Anaesthetic management of vaginal delivery in a parturient with CI esterase deficiency. *Ann Fr Anesth Reanim*. 2009;28:375–80.
- [14] Codispote CD, Rezvani M, Bernstein JA. Successful use of CI inhibitor during mitral valve replacement surgery with cardiopulmonary bypass. *Ann Allergy Asthma Immunol*. 2008;101:220.
- [15] Nathani F, Sullivan H, Churchill D. Pregnancy and CI esterase inhibitor deficiency: a successful outcome. *Arch Gynecol Obstet*. 2006;274:381–4.
- [16] Cace N, Brusich S, Dessardo S, Ahel J. Cardiopulmonary bypass in a child with hereditary angioedema. *Pediatr Int*. 2005;47:214–6.
- [17] Maeda S, Miyawaki T, Nomura S, Yagi T, Shimada M. Management of oral surgery in patients with hereditary or acquired angioedemas: review and case report. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod*. 2003;96:540–3.
- [18] Alonso JM, Fas MJ. Malignant bladder tumor transurethral resection in a patient with acquired CI inhibitor deficiency. *Acta Anaesthesiol Scand*. 2002;46:740–3.
- [19] Jabbour-Khoury S, Khoury G, Soueide A, Baraka A. Laparoscopic splenectomy in a patient with acquired angioneurotic edema. *JSLs*. 2000;4:305–7.
- [20] Alvarez JM. Successful use of CI esterase inhibitor protein in a patient with hereditary angioneurotic edema requiring coronary artery bypass surgery. *J Thorac Cardiovasc Surg*. 2000;119:168–71.
- [21] Cox M, Holdcroft A. Hereditary angioneurotic oedema: current management in pregnancy. *Anaesthesia*. 1995;50:547–9.
- [22] Maves KK, Weiler JM. Tonsillectomy in a patient with hereditary angioedema after prophylaxis with CI inhibitor concentrate. *Ann Allergy Asthma Immunol*. 1994;73:435–8.
- [23] Martin MJ, Carballo JC, Banos G. Anesthesia in a case of hereditary angioneurotic edema. *Rev Esp Anesthesiol Reanim*. 1993;40:29–31.
- [24] Ebert A, Pritze W, Weitzel HK. C-I esterase inhibitor deficiency as an obstetric problem: a case report. *Zentralbl Gynakol*. 1992;114:519–22.
- [25] Laxenaire MC, Audibert G, Janot C. Use of purified CI esterase inhibitor in patients with hereditary angioedema. *Anesthesiology*. 1990;72:956–7.

Allergic sensitization and symptoms, body mass index, and respiratory function in children with type 1 diabetes mellitus

The westernized and developing world is experiencing a marked increase in the prevalence of type 1 diabetes mellitus (T1DM), obesity, and allergic sensitization, affecting all age groups, including the young.¹ How these conditions may jointly affect pulmonary function is not known. Although T1DM is believed to be associated with a decreased airway reactivity,² obesity is thought to have negative implications on lung flows and volumes.³ However, when pulmonary function and bronchial reactivity have been studied objectively to prove these assumptions in children, findings have led to contradictory results.⁴ The third condition, allergic sensitization to inhaled allergens, which has been described to occur also in young patients with T1DM,⁵ may also play a confounding role in the impact of overweight/obesity on pulmonary function in patients with T1DM.

In a preliminary, cross-sectional study, we evaluated the influence of allergic sensitization and body mass index (BMI) on spirometry values in 67 consecutively enrolled, white patients (40 males and 27 females; median age, 12.99 years) with T1DM. The protocol was approved by the institutional ethical committee, and signed informed consents were obtained. T1DM was diagnosed according to positive pancreatic β -cell autoantibodies, fasting blood glucose level greater than 126 mg/dL, and insulin dependence. Diagnosis of allergic rhinitis was based on the concordance among a typical clinical history, examination of the nasal mucosa, and the demonstration of a positive skin reaction by skin prick tests.⁶ Asthma diagnosis was prompted by symptoms and confirmed by measurement of lung function to assess the presence of airflow limitation.⁷ Spirometry was performed and the results interpreted according to the European Respiratory Society guidelines.⁸

Median insulin dose in the study population was 0.90 U/kg/d, and the median hemoglobin A_{1c} level was 8.16%, reflecting good metabolic control. Median BMI standard deviation score (SDS) was 0.18 (ie, within normal limits), but 11 patients with T1DM (16.4%) were overweight (9 atopic and 6 nonatopic children) and 4 (5.9%) were obese (3 atopic and 1 nonatopic child) (Fig 1A). Sensitization to aeroallergens was shown to be present in 44 patients (65.7%) (40.8% in a control general population; $P = .006$).⁹ Current allergic rhinitis was detected in 20 patients with T1DM (29.8%) vs 16.5% in the general population ($P = .006$),⁹ whereas no T1DM patient had current asthma and the mean

spirometric parameters were within normal ranges. The median forced vital capacity (FVC), forced expiratory volume in 1 second (FEV₁), and forced expiratory flows at 25% to 75% of vital capacity (FEF_{25%–75%}) values were 97.6%, 104.9%, and 115.9% of predicted, respectively (Fig 1B), whereas the median FEV₁:FVC ratio was 92 (Fig 1C). Pulmonary function parameters were similar in atopic and nonatopic patients and not affected by the presence of allergic rhinitis symptoms.

In the whole T1DM population, the BMI SDS weakly related positively with FVC ($r = 0.276$, $P = .02$), FEV₁ ($r = 0.330$, $P = .006$), and FEF_{25%–75%} ($r = 0.269$, $P = .03$) but not with the FEV₁:FVC ratio ($r = 0.125$, $P = .31$). Analyzing atopic and nonatopic T1DM patients separately, the only significant correlation detected was between BMI SDS and FEV₁ ($r = .529$, $P = .01$) in the latter subgroup.

In this preliminary study in a small, “well-controlled” T1DM population, we found a low prevalence of overweight/obesity, possibly the reflection of good adherence to the diabetic diet regimen with a correct dietary intake. We also found an unexpected positive, rather than negative, influence of BMI on lung function. This finding may be the result of not only low obesity prevalence in the study population but also of the clinical management of these patients, which included an accurate metabolic balance associated with physical activity programs. Lung function appears to decrease with increasing duration of obesity and not (yet) be impaired by an increased BMI in the youngest age,¹⁰ although the so-called respiratory function and obesity paradox has been described in other chronic conditions.¹¹

In addition, we detected a high prevalence of allergic sensitization in the T1DM population, confirming previous observations.⁵ However, despite the elevated prevalence of both allergic sensitization and current allergic rhinitis symptoms, no patient had current asthma symptoms, with spirometric parameters within the normal ranges, independently from the presence of atopy and/or rhinitis. This is in agreement with the current hypothesis that recognized T1DM as a condition associated with a decreased airway reactivity to a variety of stimuli, possibly for an initial autonomic nervous system dysfunction.¹² An ongoing follow-up study will possibly answer a still open question, that is, whether optimal management of T1DM might be a protective factor for asthma development even in patients with allergic sensitization and allergic rhinitis.

Disclosures: Authors have nothing to disclose.

Funding Support: Ricerca Corrente, Italian Ministry of Health, Rome, Italy.

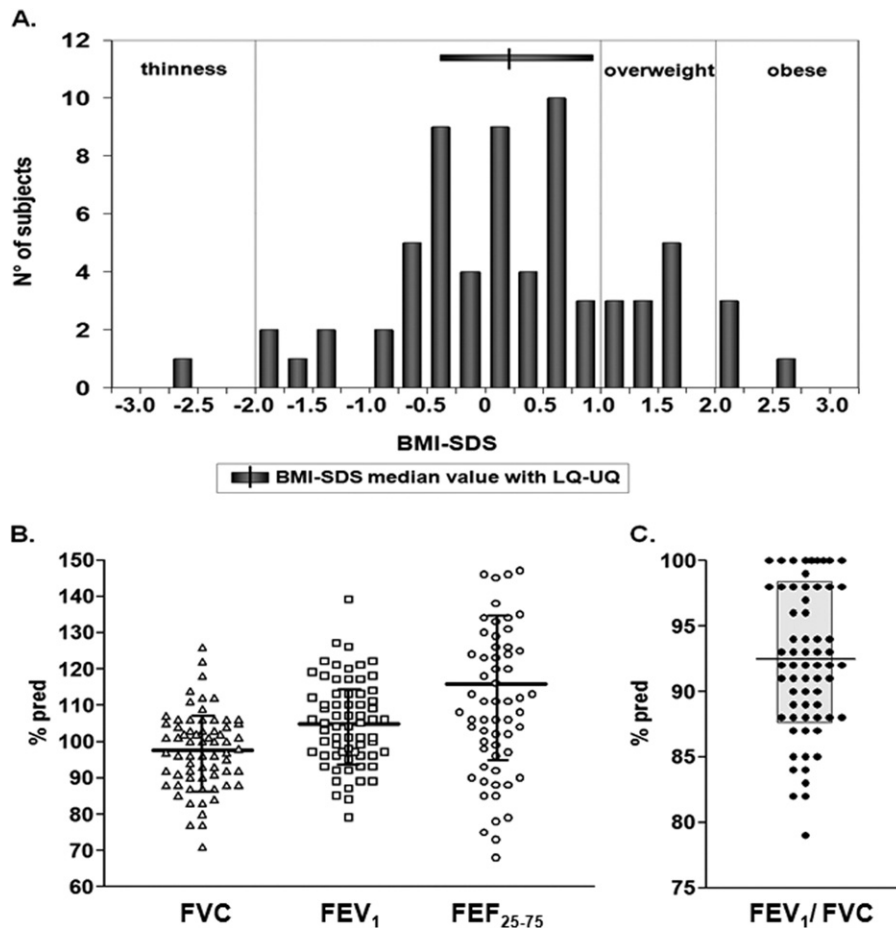


Figure 1. (A) Frequency distribution of body mass index (BMI), expressed in standard deviation score (SDS) units (z score), in the 67 patients with type 1 diabetes mellitus (T1DM). Vertical dotted lines delimitate thinness (≤ -2.0 BMI SDS units), normality (> -2.0 to ≤ 1.0 BMI SDS units), overweight (> 1.0 to ≤ 2.0 BMI SDS units), and obesity (> 2.0 BMI SDS units). In the upper part, the median BMI SDS with lower quartile (LQ) and upper quartile (UQ) are shown. (B) Pulmonary function values in the 67 T1DM patients: forced vital capacity (FVC), forced expiratory volume in 1 second (FEV₁), and forced expiratory flow at 25% to 75% of the vital capacity (FEF_{25-75%}) as percentage of predicted. (C) FEV₁:FVC ratio expressed as percentage of predicted.

Maria Angela Tosca, MD*
 Michela Silvestri, BS*
 Roberta Olcese, MD*
 Giuseppe D'Annunzio, MD†
 Angela Pistorio, MD‡
 Renata Lorini, MD†
 Giorgio Ciprandi, MD§
 Giovanni A. Rossi, MD*

*Pediatric Pulmonary and Allergy Unit

†Pediatric Clinic, University of Genoa
 Genoa, Italy

‡Epidemiology and Biostatistics Unit
 IRCCS G. Gaslini Institute
 Genoa, Italy

§IRCCS-Azienda Ospedaliera Universitaria San Martino
 Genoa, Italy

E-mail address: gio.cip@libero.it

References

- [1] Cottrell L, Neal WA, Ice C, et al. Metabolic abnormalities in children with asthma. *Am J Respir Crit Care Med*. 2011;183:441–448.
- [2] Villa M, Cacciari E, Bernardi F, et al. Bronchial reactivity in diabetic patients: relationship to duration of diabetes and degree of glycemic control. *Am J Dis Child*. 1988;142:726–729.
- [3] Ashburn DD, DeAntonio A, Reed MJ. Pulmonary system and obesity. *Crit Care Clin*. 2010;26:597–602.
- [4] Inselman LS, Milanese A, Deurloo A. Effect of obesity on pulmonary function in children. *Pediatr Pulmonol*. 1993;16:130–137.
- [5] Tosca MA, Villa E, Silvestri M, et al. Discrepancy between sensitization to inhaled allergens and respiratory symptoms in pediatric patients with type 1 diabetes mellitus. *Pediatr Allergy Immunol*. 2009;20:385–391.
- [6] Bousquet J, Khaltaev N, Cruz AA, et al. Allergic Rhinitis and its Impact on Asthma (ARIA) 2008 update (in collaboration with the World Health Organization, GA(2)LEN and AllerGen). *Allergy*. 2008;63:990–996.
- [7] GINA Report: Global Strategy for Asthma Management and Prevention. Updated December 2010. www.ginasthma.org. Accessed October 24, 2011.
- [8] Miller MR, Hankinson J, Brusasco V, et al. Standardisation of spirometry. *Eur Respir J*. 2005;26:319–338.
- [9] Crimi P, Minale P, Tazzer C, et al. Asthma and rhinitis in schoolchildren: the impact of allergic sensitization to aeroallergens. *J Investig Allergol Clin Immunol*. 2001;11:103–106.
- [10] Mallory GB, Fiser DH, Jackson R. Sleep associated breathing disorders in morbidly obese children and adolescents. *J Pediatr*. 1989;115:892–897.
- [11] Guenette JA, Jensen D, O'Donnell DE. Respiratory function and the obesity paradox. *Curr Opin Clin Nutr Metab Care*. 2010;13: 618–624.
- [12] Belmonte K, Fryer A, Costello R. Role of insulin in antigen-induced airway eosinophilia and neuronal M2 muscarinic receptor dysfunction. *J Appl Physiol*. 1998;85:1708–1718.