



Underdiagnosis and overdiagnosis of asthma in the morbidly obese[☆]



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Summary

Background: The prevalence of obesity and asthma has increased concurrently over the last decades, suggesting a link between obesity and asthma. However, asthma might not be adequately diagnosed in this population.

Aim: To investigate whether not only overdiagnosis but also underdiagnosis of asthma is present in an obese population.

Methods: Morbidly obese subjects with or without physician-diagnosed asthma were recruited from a pre-operative screening programme for bariatric surgery, and were characterized using an extensive diagnostic algorithm.

Results: 473 subjects were screened; 220 met inclusion criteria, and 86 agreed to participate. Among the 32 participating subjects who had a physician diagnosis of asthma, reversible airway obstruction and/or bronchial hyperresponsiveness could only be detected in 19 patients (59%.

Abbreviations: ACQ, Asthma Control Questionnaire; AQLQ, mini Asthma Quality of Life Questionnaire; BHR, bronchial hyperresponsiveness; BMI, body mass index; DLCO, diffusion capacity; ERV, expiratory reserve volume; ESS, Epworth Sleepiness Scale; FEF_{25–75}, Forced expiratory flow at 25% point to the 75% point of Forced Vital Capacity; FeNO, Nitric Oxide; FEV₁, forced expiratory volume in 1 s; FRC, functional residual capacity; FVC, forced vital capacity; GERD, Gastro oesophageal reflux disease; ICS, inhaled corticosteroid; IOS, impulse oscillometry; OSAS, obstructive sleep apnea syndrome; RV, residual volume; SPT, skin prick test; TLC, total lung capacity.

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95% CI [0.41–0.76]), whereas in 13 patients (41%, 95% CI [0.24–0.50]) the diagnosis of asthma could not be confirmed (overdiagnosis). In contrast, in the remaining 54 patients, 17 (31%, 95% CI [0.20–0.46]) were newly diagnosed with asthma (underdiagnosis).

Conclusion: Besides overdiagnosis, there is also substantial underdiagnosis of asthma in the morbidly obese. Symptoms could be incorrectly ascribed to either obesity or asthma, and therefore also in the morbidly obese the diagnosis of asthma should also be based on pulmonary function testing.

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Introduction

The prevalence and incidence of asthma has increased over the recent decades.^{1,2} Besides an improved awareness of the disease, there are several other explanations for the increased asthma prevalence, such as air pollution, exposure to tobacco smoke, change in diet and obesity.² Recently, the incidence and prevalence of obesity have increased concurrently with the incidence and prevalence of asthma, suggesting a possible link between obesity and asthma.^{3,4}

International guidelines advise that asthma diagnosis should be based on both the presence of symptoms and objective measurements of variable airflow obstruction or bronchial hyperresponsiveness (BHR).¹ However, in daily practice spirometry or provocation tests are not always performed, and the diagnosis of asthma is mainly based on symptoms.⁵ Since obese patients report more dyspnea and asthma-like symptoms than non-obese patients,^{6,7} it might be that they unjustified get labeled as asthma (overdiagnosis) without performing adequate diagnostics. Inevitably, any misdiagnosis may lead to inappropriate treatment,⁵ with increased risk of side-effects and increased costs.⁸

Many epidemiological studies concerning obesity and asthma have used physician-diagnosed asthma without confirmation by pulmonary function tests. This implies reasonable doubt as to the correctness of the diagnosis. Multiple studies report that asthma could be excluded after extensive testing in 30% of physician-diagnosed asthma,^{9–11} even after stopping with asthma medication.¹² On the other hand, missing the diagnosis of asthma in this population is also an important issue. Impaired dyspnea perception is especially thought to play a role in severe asthma,^{13,14} and poor perception of airflow obstruction may lead to under-treatment of asthma.^{15,16} All the recent studies concerning overdiagnosis of asthma in the obese,^{11,12,17} initially used selected subjects with asthma, and therefore did not take into account obese patients in which asthma was not detected. Therefore, the information about underdiagnosis of asthma in the obese is incomplete.

The hypothesis of the present study was that underdiagnosis of asthma is also present in the morbidly obese. We therefore used an extensive diagnostic algorithm to investigate whether in addition to overdiagnosis also underdiagnosis of asthma is present in a morbidly obese cohort, which was recruited from a pre-operative screening program for bariatric surgery.

Methods

Study population

The subjects included in this study were patients who underwent pre-operative screening before bariatric surgery in the Sint Franciscus Gasthuis in Rotterdam, the Netherlands from September 2009 to April 2011. Eligibility criteria for bariatric surgery were: age between 18 and 60 years old, body mass index (BMI) ≥ 35 kg/m². We excluded people who (a) were older than 50 years of age or; (b) had a history of smoking more than 10 cigarettes a day, or were currently smoking more than 10 cigarettes a day (with the aim to decrease the risk of including subjects with chronic obstructive pulmonary disease [COPD]); (c) were taking oral corticosteroid therapy; (d) had an asthma exacerbation four weeks before screening; (e) were unable to perform pulmonary function tests; or (f) had pulmonary disease other than asthma.

We aimed for 40 subjects with, and 40 subjects without asthma, as this study is a part of a longitudinal study. All subjects underwent baseline physical examinations including routine assessment of anthropometry, blood pressure and blood samples. Waist circumference was measured directly to the body surface midway between the lower rib margin and the ileac crest. Fat free mass and fat weight (in kg and % body weight) were measured using bio-electrical impedance analysis (Bodystat 1500, Bodystat Ltd, British Isles).¹⁸

All subjects gave written informed consent and the local ethics committee (Toetsingscommissie Wetenschappelijk Onderzoek Rotterdam e.o.) approved the study protocol (Netherlands Trial Register 3204).

Pulmonary function tests

All subjects underwent lung function testing for the presence of reversible airflow obstruction as part of the screening protocol before bariatric surgery. Spirometry was performed with Vmax spirometer (Vmax SensorMedics Viasys, type Encore 20/22/229/62 Encore, Cardinal Health, USA) before and after 400 μ g of inhaled salbutamol, according to the American Thoracic Society/European Respiratory Society guidelines.¹⁹ All values obtained were related to height, age and gender and expressed as percentage of their predicted value (reference ERS 1993²⁰). The pulmonary function results are prebronchodilator values unless otherwise specified.

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