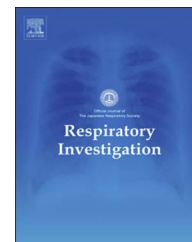




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Rapid Communication

A difference in the effects of a comorbidity of allergic rhinitis on asthma symptoms between obese and non-obese patients

Masako To^{a,b}, Ryuta Tsuzuki^a, Otohito Katsube^a, Satoshi Yamawaki^a,
Seiko Soeda^a, Yuta Kono^a, Natsue Honda^b, Ichino Kano^b, Kosuke Haruki^b,
Yasuo To^{a,*}

^aDepartment of Allergy and Respiratory Medicine, The Fraternity Memorial Hospital, 2-1-11 Yokoami, Sumida, Tokyo 130-8587, Japan

^bDepartment of Laboratory Medicine, Dokkyo Medical University, Saitama Medical Center, 2-1-50 Minami-Koshigaya, Koshigaya City, Saitama 343-8555, Japan

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1. Introduction

The association between asthma and obesity has been highlighted recently. Obesity has been reported to be associated with poor asthma control and increased asthma severity [1,2]. Obesity-related non-eosinophilic asthma has been identified as a phenotype of asthma that is characterized by late onset, female predominance, and an increased frequency in the occurrence of asthma-related severe symptoms [3].

Comorbidity of allergic rhinitis is also recognised to be a factor in poor asthma control. The rate of uncontrolled asthma has been reported to be higher in asthmatic patients

with allergic rhinitis than in those without rhinitis [4]. The severity of rhinitis symptoms assessed using a visual analogue scale (VAS) has been shown to have an association with that of asthma symptoms similarly assessed using a VAS [5,6].

Thus, both obesity and comorbidity of allergic rhinitis are risk factors for poor asthma control. However, the precise associations among obesity, asthma, and allergic rhinitis, especially with regard to symptom scores, are unclear. The aim of this study was to investigate the effects of comorbidity of rhinitis on asthma symptoms in obese and non-obese patients with asthma.

*Corresponding author.

E-mail addresses: m-to@dokkyomed.ac.jp (M. To), 5okatsube@gmail.com (O. Katsube), wakiwakiwakiwaki1986@yahoo.co.jp (S. Yamawaki), soeda_seiko@yahoo.co.jp (S. Soeda), yuta.kono1978@gmail.com (Y. Kono), nhonda@dokkyomed.ac.jp (N. Honda), m_ikano@nitobebunka.ac.jp (I. Kano), kos-h@dokkyomed.ac.jp (K. Haruki), yto-alg@umin.ac.jp (Y. To).

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2. Patients and methods

A total of 124 adult patients with asthma who visited the outpatient clinic of our hospital were enrolled in this study. The inclusion criteria were as follows: (1) patients with asthma diagnosed according to the Global Initiative for Asthma (GINA) guidelines, (2) patients on regular medication taken for ≥ 1 year before enrolment, and (3) patients who did not have any other respiratory diseases, including old tuberculosis or diffuse emphysema. Clinical and spirometry data for each patient were collected from electronic medical records. A survey was performed between September and December using the Self-assessment of Allergic Rhinitis and Asthma (SACRA) questionnaire as described in detail in a previous study [7]. The questions on rhinitis in the SACRA questionnaire are evaluated as follows: Q1, one or more responses of 'Yes' indicate potential allergic rhinitis; Q2,

two responses of 'Yes' indicate perennial rhinitis; and Q3, four responses of 'Yes' indicate severe rhinitis.

The patients were divided into two groups based on whether they were obese (BMI ≥ 25 kg/m²) or not obese (BMI <25 kg/m²) using the criteria of the Japan Society for the Study of Obesity, and data were compared between these groups. Statistical analyses were performed using IBM SPSS Statistics v.24. Comparisons of continuous variables between two groups were made by the Mann-Whitney U test. Non-parametric Spearman correlation analysis was used to evaluate correlations between two parameters. The Fisher's exact test was used to compare proportions for categorical variables. The study was approved by the research ethics committee of The Fraternity Memorial Hospital (approval number: 186). All the participants gave us their written informed consent to be included in this study, and their anonymity was preserved using methods approved by the ethics committee.

Table 1 – Demographic data, spirometry data, and questionnaire results of enrolled patients.

	Non-obese group	Obese group	p
n	92	32	
Body mass index (kg/m ²)	21.9 (20.1–23.1)	27.4 (26.6–29.3)	<0.001
Age (yr)	58 (41–68)	52 (40–68)	0.631
Sex (F:M)	54: 38	17: 15	0.679
Asthma therapy			
ICS	91 (99%)	31 (97%)	0.451
LTRA	52 (57%)	16 (50%)	0.543
Daily use of oral corticosteroids	7 (8%)	1 (3%)	0.679
Spirometry			
FVC (^L)	2.70 (2.03–3.44)	2.50 (1.93–3.14)	0.349
%FVC (%)	89.0 (77.6–103.6)	83.5 (69.3–89.6)	0.024
FEV ₁ (^L)	2.06 (1.52–2.77)	1.97 (1.48–2.60)	0.633
%FEV ₁ (%)	83.4 (80.2–86.6)	83.8 (80.8–87.2)	0.396
FEV ₁ /FVC (%)	80.0 (69.3–86.9)	82.8 (73.9–85.5)	0.451
%PEF (%)	80.5 (60.3–96.0)	82.2 (65.5–105.3)	0.597
RAST positive			
House dust	35 (59%)	15 (58%)	1.000
Mite	32(57%)	16 (62%)	0.811
Japanese cedar	30 (60%)	14 (64%)	0.800
SACRA questionnaire			
Asthma			
Q1: asthma symptoms > 3 times	11 (12%)	4 (13%)	1.000
Q2: activities were limited	4 (4%)	5 (16%)	0.049
Q3: sleep disturbance	17 (18%)	5 (16%)	0.795
Q4: rescue use of SABA > 3 times	19 (21%)	4 (13%)	0.430
Rhinitis			
Q1: potential allergic rhinitis	55 (60%)	19 (59%)	1.000
Q2: perennial rhinitis	8 (9%)	3 (9%)	1.000
Q3: severe rhinitis	40 (43%)	14 (44%)	1.000

Data are presented as median (interquartile range) or n (%).

ICS: Inhaled corticosteroids; LTRA: leukotriene receptor antagonists; FVC: Forced vital capacity; FEV₁: forced expiratory volume in 1 second; PEF: peak expiratory flow; RAST: radioallergosorbent test; SACRA: the self-assessment of allergic rhinitis and asthma; SABA: short-acting beta agonists.

3. Results

Thirty-two asthmatic patients who were obese (OB) and 92 asthmatic patients who were not obese (NOB) were enrolled in this study. There were no significant differences in the ages, main spirometry data (except for %FVC), or the percentages of subjects with sensitization to specific antigens evaluated by radioallergosorbent tests (RAST) between the OB and NOB groups (Table 1). The SACRA questionnaire revealed that a higher percentage of patients in the OB group experienced limitations in daily activities by asthma symptoms ($p = 0.049$) (Table 1). There were no significant differences in the percentages of patients with rhinitis, perennial rhinitis, and severe rhinitis between the OB and NOB groups.

Next, we investigated the correlations between the VAS scores assigned to the rhinitis symptoms (Rhinitis VAS) and those assigned to the asthma symptoms (Asthma VAS). The asthma VAS were positively correlated with the rhinitis VAS in the NOB group ($r_s = 0.353$, $p = 0.008$) (Fig. 1A) but not in the OB group ($r_s = -0.009$, $p = 0.971$) (Fig. 1B). The BMIs and asthma VAS were not significantly correlated in the NOB group ($r_s = 0.076$, $p = 0.581$) (Fig. 1C) but did show a trend toward a positive correlation in the OB group ($r_s = 0.454$, $p = 0.050$) (Fig. 1D). There were no significant correlations between the BMIs and rhinitis VAS in both the NOB ($r_s = 0.201$, $p = 0.141$) and OB ($r_s = 0.269$, $p = 0.266$) groups.

4. Discussion

In our study, the percentages of patients with co-existing asthma and allergic rhinitis and the severity of rhinitis did not differ between obese and non-obese patients with asthma. The absence of a significant correlation between the BMIs and rhinitis VAS in each group was observed. These results are consistent with a previous report [8].

An important and interesting finding in this study was that a significant correlation between the asthma VAS and rhinitis VAS was detected in the non-obese asthma patients but was not found in the obese patients with asthma. An association between asthma symptom scores and rhinitis symptom scores has been reported in asthma populations in general [4–6], but the lack of this association in obese patients with asthma implies that these patients might be affected by a different type of pathology. In contrast, the asthma VAS showed trends of correlating with BMIs in obese patients, but this was not observed in non-obese patients. A possible reason for this finding is that the worsening of asthma symptoms in obese asthmatic patients is more closely associated with obesity-related factors, such as chronic inflammation caused by adipocytokines and systemic oxidative stress [9], than with a comorbidity of rhinitis (type 2 inflammation). These findings should make an important

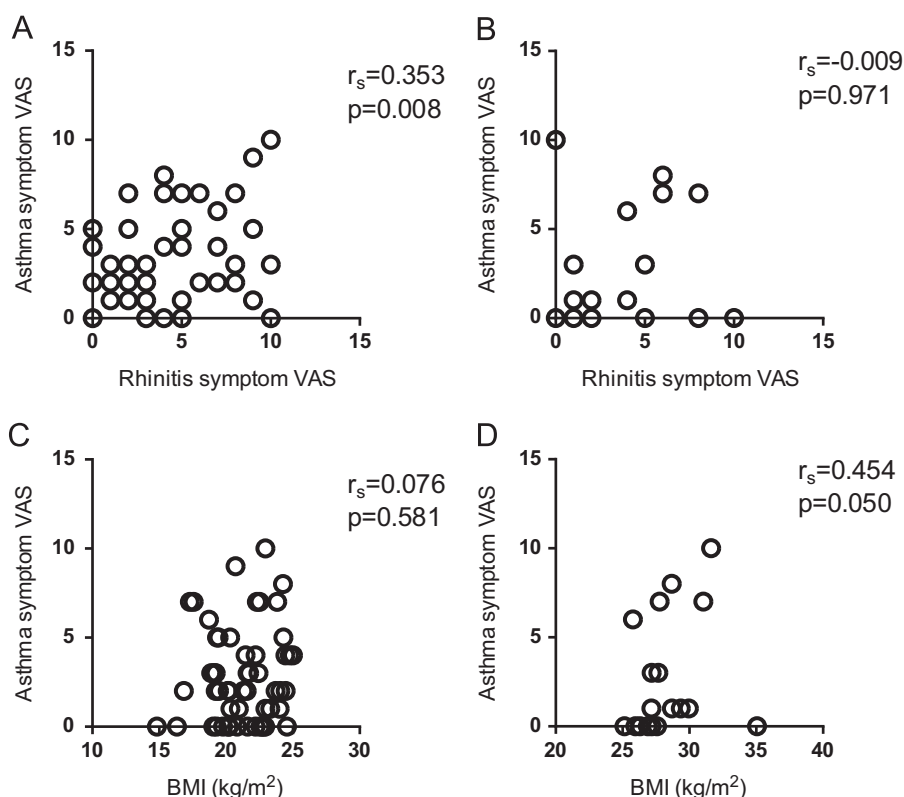


Fig. 1 – Correlations between VAS scores for rhinitis symptoms, VAS scores for asthma symptoms, and body mass index
A correlation analysis was performed in each group. (A) Rhinitis VAS vs. Asthma VAS in the non-obese asthma group ($n = 55$); (B) Rhinitis VAS vs. Asthma VAS in the obese asthma group ($n = 19$); (C) BMI vs. Asthma VAS in the non-obese asthma group ($n = 55$); (D) BMI vs. Asthma VAS in the obese asthma group ($n = 19$). Rhinitis VAS: visual analogue scale scores for rhinitis symptoms; Asthma VAS: visual analogue scale scores for asthma symptoms; BMI: body mass index.

contribution to our understanding of the physiology of obese asthma patients and to the phenotyping of asthma.

A key strength of this study was that all the included patients were diagnosed with asthma by trained allergy specialists or physicians under training to be allergy specialists based on the GINA guidelines. On the other hand, a limitation must be considered when interpreting our results. The sample size of this study was small; therefore, the conclusion may be affected by this limitation. However, the data from our study can provide important information for future large-scale studies.

5. Conclusions

To sum up, an association between asthma symptom scores and rhinitis symptom scores, which has been observed in asthma populations in general, was not detected in obese asthmatic patients. Rhinitis-related factors seem to affect asthma symptoms less than obesity-related factors in adult obese asthmatic patients. This finding provides important information that can be used to plan and design future large-scale studies.

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Conflict of interest

None.

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