

Fractional Exhaled Nitric Oxide and Asthma Control in Thai Adult Asthma With and Without Rhinitis

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Background

Both allergic rhinitis (AR) and non allergic rhinitis (NAR) impact on asthma clinical outcomes. Fractional exhaled nitric oxide (FeNO), sputum eosinophils, and blood eosinophil are biomarkers of type 2 inflammation in asthma. Furthermore, FeNO levels has been widely used in practice. The increased FeNO level in asthma with and without allergic rhinitis has been reported. There was no previous study regarding the association of FeNO and asthma control in the presence of rhinitis in Thai adult asthma patients.

Objectives

Primary objective: To determine eosinophilic airway inflammation measured by using fractional exhaled nitric oxide (FeNO) among Thai adult with asthma in association with rhinitis.

Secondary objective: Asthma control composite score (ACT and ACQ-7) among asthmatic patients in the presence and the absence of allergic rhinitis.

Materials and methods

Prospective cross-sectional analytic study

Inclusion criteria

1. Diagnosed asthma and treated in chest clinic
2. Age \geq 15-year-old
3. Completed inform consent

Exclusion criteria

1. Asthmatic exacerbation within 8 weeks
2. Unable to perform spirometry and FeNO maneuver
- 3 COPD or Asthma-COPD overlaps syndrome (ACOS)
- 4 Smoking \geq 10 pack-years/history of biomass exposure
- 5 Using systemic corticosteroid within 8 weeks

Clinical Characteristics	Healthy subject	Asthma without rhinitis	Asthma with non allergic rhinitis (NAR)	Asthma with mild AR	Asthma with moderate to severe AR
Asthmatic symptoms	×	✓	✓	✓	✓
Rhinitis symptoms	×	×	✓	✓	✓
Skin prick test or specific IgE	Negative	Negative/Positive	Negative	Positive	Positive
Severity of rhinitis (ARIA questionnaires)	NA	NA	Mild/Moderate/Severe	Mild	Moderate/Severe
ACT/ ACQ-7/ FeNO/Blood Eosinophil	←—————→				

Table 1: Definition of healthy subjects, asthma patients without and with AR, asthma with mild AR and asthma with moderate to severe AR

References

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Results Patient and subject demographic and clinical characteristics among 5 groups

Clinical characteristics	Healthy subjects	Asthma without rhinitis	Asthma with NAR	Asthma with mild AR	Asthma with moderate-severe AR	P-value
Number (%)	16 (13.7%)	21 (18.1%)	32 (27.5%)	20 (17.2%)	27 (23.2%)	
Age (mean \pm SD)	34.0 \pm 8.96	60.0 \pm 12.6	63.5 \pm 15.4	60.40 \pm 17.6	55.85 \pm 15.7	0.0001
BMI (mean \pm SD)	23.8 \pm 6.02	26.73 \pm 4.6	25.37 \pm 5.2	25.94 \pm 7.86	23.91 \pm 4.0	0.1899
FEV ₁ /FVC	0.86 \pm 0.08	0.71 \pm 0.18	0.77 \pm 0.09	0.71 \pm 0.20	0.75 \pm 0.16	0.0004
Pre-BD FEV ₁ (%)	88.0 \pm 13.0	80.0 \pm 28.0	79.0 \pm 25.5	78.0 \pm 19.50	77.0 \pm 24.0	0.1275
Post-BD FEV ₁ %	90.50 \pm 14.0	79.0 \pm 27.0	83.1 \pm 21.5	81.50 \pm 15.5	81.0 \pm 24.0	0.1481
Pre-BD FVC%	90.0 \pm 12.50	88.0 \pm 27.0	89.0 \pm 18.0	83.0 \pm 18.0	89.0 \pm 18.00	0.9255
Post-BD FVC%	91.0 \pm 11.5	88.0 \pm 26.0	89.5 \pm 18.0	86.0 \pm 19.5	89.0 \pm 15.0	0.9945
Pre-BD FEF ₂₅₋₇₅	87.0 \pm 25.20	36.0 \pm 23.00	55.70 \pm 25.8	52.0 \pm 37.1	57.00 \pm 43.0	0.0001
Post-BD FEF ₂₅₋₇₅	95.5 \pm 29.5	50.0 \pm 32.0	67.40 \pm 40.0	59.5 \pm 34.0	65.0 \pm 51.0	0.0012
Respiratory co-morbidities (%)	1 (6.25%)	1 (4.27%)	2 (6.25%)	2 (10%)	3 (11.1%)	0.78
ICS or ICS/LABA	0 (0%)	20 (95.2%)	30 (93.7%)	19 (95%)	27 (100%)	0.000
LAMA	0 (0%)	2 (9.5%)	3 (9.3%)	6 (30%)	6 (22.2%)	0.239
SABA	0 (0%)	15 (71.4%)	25 (78.1%)	11 (55%)	18 (66.67%)	0.000
Antihistamine	0 (0%)	8 (38.1%)	13 (40.6%)	8 (40%)	23 (85.1%)	0.035
MCS	0(0%)	2 (9.5%)	10 (31.25%)	6 (30%)	5 (18.5%)	0.054
ACT score mean + SD	24.81 \pm 0.54	23.33 \pm 1.62	22.40 \pm 2.67	22.75 \pm 2.80	21.92 \pm 2.71	0.0000
ACQ-7 score median (min-max)	0.25 (0.14-0.35)	0.64 (0.28-0.85)	0.91 (0.42-1.14)	0.72 (0.42-1.0)	1.01 (0.42-1.57)	0.0000

Table 1: Patients characteristics including medication use for asthma and AR

Abbreviations: BMI; body mass index, FEV₁; forced expiratory volume in 1 second, FVC; forced vital capacity, BD; bronchodilator, ICS; inhaled corticosteroid, LABA; long acting B2 agonist, SABA; short acting B2 agonist, LAMA; long acting anti-muscarinic, MCS; mast cell stabilizer, ACT; asthma control test, ACQ-7 Asthma control questionnaire-7

Conclusions

Increased FeNO is observed in asthma with or without rhinitis compare to healthy subject. FeNO is not capable of differentiating asthma with rhinitis from asthma without rhinitis. Increased blood eosinophils in asthma regardless of rhinitis compared to healthy subject. Neither increased FeNO nor increased blood eosinophils is correlated with asthma control level determining by ACT score and ACQ-7 score.

Results FeNO, blood eosinophils and ACQ-7 among 5 groups

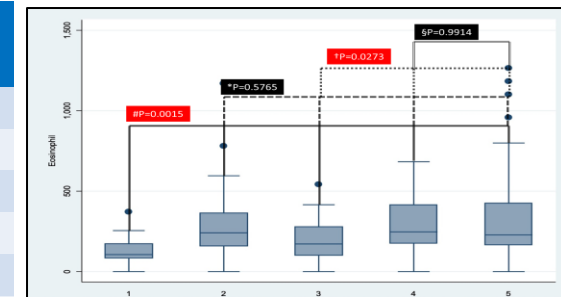


Figure 1: FeNO (ppb) among patients regarding the diagnosis

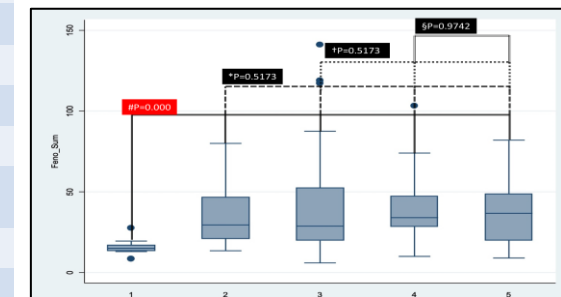


Figure 2: Blood eosinophil counts regarding the diagnosis

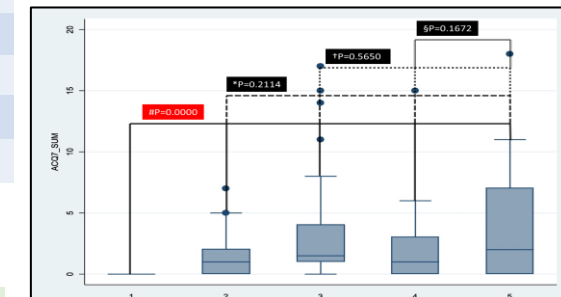


Figure 3: Sum ACQ-7 score regarding the diagnosis

Code 1; Healthy, Code 2; Asthma without rhinitis, Code 3; Asthma with non allergic rhinitis (NAR), Code 4; Asthma with mild AR, Code 5; Asthma with moderate to severe AR