

## ORIGINAL ARTICLE

# Correlation between Allergic Rhinitis and Rhinosinusitis in ENT Outpatient Clinic Patients

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## ABSTRACT

**Introduction:** Rhinosinusitis and allergic rhinitis are common health problems. Allergic rhinitis patients tend to have edema on their nasal mucosa, disrupted cilia, and excessive secrete production that clogged paranasal sinuses' ostiums and lead to inflammation and infection of the paranasal sinuses. There is still a contradiction of allergic rhinitis as predisposing factor of rhinosinusitis. Those correlation is not yet clear, thus we aim to analyze the correlation between allergic rhinitis and rhinosinusitis.

**Methods:** This study was a cross-sectional design. The samples were obtained by consecutive sampling. Adult patients above 19 years old with nasal discharge were examined by the doctors on duty and interviewed. Medical data obtained was recorded and analyzed using chi square test.

**Results:** From 98 patients, 17 patients (17.35%) had both rhinosinusitis and allergic rhinitis, 48 patients (48.98%) only had rhinosinusitis, and 13 patients (13.26%) only had allergic rhinitis. Patients who had neither rhinosinusitis nor allergic rhinitis reported to be 20 patients (20.41%). Chi square test showed that allergic rhinitis had no significant correlation with rhinosinusitis ( $p=0.266$ ).

**Conclusion:** There is no significant correlation between allergic rhinitis and rhinosinusitis. Rhinosinusitis is a multifactorial disease.

## Introduction

Rhinosinusitis is described as an inflammation of the nasal and paranasal sinuses mucosa. Signs and symptoms are nasal congestion or blockage, nasal discharge or postnasal drip, facial pain, and reduction or loss of smell. One of many factors predisposing rhinosinusitis is allergic rhinitis.<sup>1</sup> Relation between allergic rhinitis and rhinosinusitis might be multifactorial. Anatomically, allergic rhinitis patients tend to have nasal mucosal edema, disrupted cilia, and excessive secrete production. Those lead to blockage of the paranasal sinuses' ostiums and infection.<sup>2</sup>

Rhinosinusitis is a common health problem. There are two types of rhinosinusitis, acute and chronic. Acute rhinosinusitis resolves in 12 weeks while chronic rhinosinusitis does not resolve and continues for more than 12 weeks. Prevalence of acute and chronic rhinosinusitis in Europe are around 6-15% and 5-15%. Adults could get acute rhinosinusitis 2-5 times in a year while children 7-10 times in a year. Predisposing factors

are air pollution, high air humidity, allergy, tobacco smoking, nasal anatomic abnormalities such as septum deviation and polyps, gastro esophageal reflux disease, depression, antibiotic resistance, and abnormality of the cilia.<sup>1</sup>

Allergic rhinitis is a non-infectious rhinitis. Signs and symptoms are sneezing, itchy nose, non-purulent and bilateral nasal discharge, nasal blockage, red, itchy, and watery eyes, and edema of the conjunctiva.<sup>1,3</sup> Prevalence of allergic rhinitis in the USA is 10-30% in adults and 40% in children.<sup>4</sup> Common causes are allergens such as pollen, fungi, house dust mite, animals fur, rodent, and cockroach.<sup>5</sup> Comorbidities could be conjunctivitis, chronic otitis media, Eustachian tube dysfunction, obstructive sleep apnea, rhinosinusitis, loss of smell, skin rash, headache, gastro esophageal reflux disease, and asthma.<sup>3,4</sup>

There are differences in studies' results about allergic rhinitis as a predisposing factor of rhinosinusitis. A European position paper on rhinosinusitis and nasal



polyps consists of review of many papers mentioned that there was significant correlation between allergic rhinitis and rhinosinusitis. Allergic rhinitis patients had a risk of rhinosinusitis 4.4 times greater than healthy people. However one paper stated that the different prevalence of rhinosinusitis in allergic rhinitis patients and healthy people are not significant. On the other hand, another paper also could not find enough evidence of allergic rhinitis role in acute rhinosinusitis.<sup>1</sup>

Those different opinion shows that correlation between allergic rhinitis and rhinosinusitis is not clearly understood. This study aims to analyze the correlation between allergic rhinitis and rhinosinusitis.

## Methods

Data were obtained from Dr. Soetomo General Hospital Ear, Neck and Throat (ENT) outpatient clinic during January-February 2017. All patients with symptom of nasal discharge above 19 years old were interviewed and examined by the doctor in charge. Patients with suspicion of allergic rhinitis underwent skin prick test.

Rhinosinusitis was diagnosed by interview and physical examination using anterior rhinoscopy. Rhinosinusitis could be diagnosed if there were at least two symptoms, one of which should be nasal blockage/congestion or nasal discharge/postnasal drip. Other symptoms could be facial pain or reduction/loss of smell.<sup>1,6</sup> Examination with anterior rhinoscopy could show inflammation or edema of the mucosa, purulent nasal discharge, polyps, or septum deviation.<sup>1</sup>

Allergic rhinitis was diagnosed by skin prick test. Allergens were dropped on the volar side of the forearm then pricked with a lancet. Positive reaction showed wheal more than 3 mm diameter after 15-20 minutes.<sup>7</sup> Symptoms present were nasal blockage, itchy nose, sneezing, nasal discharge, postnasal drip, itchy soft palate, itchy throat, lethargic, morning or afternoon sleepiness, dry mouth, itchy eyes, habit of rubbing the nose called allergic salute, breathing through the mouth.<sup>3,8,9</sup> Examination with anterior rhinoscopy could show inflammation or boggy mucosa and excessive production of non-purulent nasal discharge.<sup>10</sup>

Patients were given information to consent, some of them who agreed to join this study as subjects signed informed consent letter. Data from interview and physical examination was recorded. All data analyses were performed using IBM SPSS 23.0 (New York, USA). The data was analyzed using chi square test with a significant value of  $p < 0.05$ .

## Results

Data was obtained from 98 patients. There were 65 patients (66.33%) with rhinosinusitis and 17 of those patients (17.35%) with allergic rhinitis. The other 33 patients (33.67%) did not have rhinosinusitis and 13 of those patients (13.27%) had allergic rhinitis. Women were found to be more predominant in both rhinosinusitis and allergic rhinitis with proportions of 58.46% and 63.33% consecutively. Youngest patient of both rhinosinusitis and allergic rhinitis was 20 years old. Oldest patient of rhinosinusitis and allergic rhinitis

were 74 years old and 73 years old consecutively. Mean age of rhinosinusitis and allergic rhinitis patients were 42.66 years old and 40.1 years old consecutively. Range of age with the most and the least of rhinosinusitis patients were 50—59 years old with proportion of 27.69% and 60—69 years old with proportion of 4.62% consecutively. Range of age with the most and the least of allergic rhinitis patients were 20—29 years old with proportion of 33.33% and more than 69 years old with proportion of 3.33% consecutively. Housewives were found to be the most predominant in both rhinosinusitis with proportion of 24.62% and allergic rhinitis with proportion of 23.33%.

Table 2. Clinical characteristics of rhinosinusitis. (n=65)

Clinical characteristics	n (%)
Main symptoms	
Nasal discharge/postnasal drip	65 (100.00)
Nasal blockage/congestion	58 (89.23)
Facial pain	40 (61.54)
Reduction/loss of smell	24 (36.92)
Accompanying symptoms	
Headache	45 (69.23)
Sleep disturbance	34 (52.31)
Malaise	28 (43.08)
Cough	26 (40.00)
Fever	22 (33.85)
Dysphonia	20 (30.77)
Sore throat	20 (30.77)
Toothache	15 (23.08)
Ear pain	11 (16.92)
Drowsiness	2 (3.08)

Table 3. Clinical characteristics of allergic rhinitis. (n=30)

Clinical characteristics	n (%)
Positive reactions in skin prick test done at Dr. Soetomo General Hospital ENT outpatient clinic (n=17)	
House dust mite	15 (88.24)
Dog fur	11 (64.71)
Cat fur	11 (64.71)
Kapok	11 (64.71)
History of atopy in family (n=30)	
Yes	11 (36.67)
No	19 (63.33)

Table 4. Correlation between allergic rhinitis and rhinosinusitis

	Diagnosed with rhinosinusitis	Not diagnosed with rhinosinusitis	ps
Allergic rhinitis	17/65	13/33	0.266

Table 1. Subjects characteristics. (n=98)

Characteristics	Rhinosinusitis with allergic rhinitis (n=17)	Rhinosinusitis without allergic rhinitis (n=48)	Without rhinosinusitis with allergic rhinitis (n=13)	Without rhinosinusitis without allergic rhinitis (n=20)
	n(%)	n(%)	n (%)	n(%)
<b>Gender</b>				
Men	6 (6.12)	21 (21.43)	5 (5.10)	10 (10.20)
Women	11 (11.22)	27 (27.55)	8 (8.16)	10 (10.20)
<b>Age</b>				
20—29 years old	4 (4.08)	13 (13.26)	6 (6.12)	5 (5.10)
30—39 years old	4 (4.08)	7 (7.14)	1 (1.02)	2 (2.04)
40—49 years old	2 (2.04)	10 (10.20)	5 (5.10)	2 (2.04)
50—59 years old	5 (5.10)	13 (13.26)	0 (0.00)	7 (7.14)
60—69 years old	1 (1.02)	2 (2.04)	1 (1.02)	4 (4.08)
>69 years old	1 (1.02)	3 (3.06)	0 (0.00)	0 (0.00)
<b>Occupation</b>				
Housewife	4 (4.08)	12 (12.24)	3 (3.06)	3 (3.06)
Entrepreneur	4 (4.08)	11 (11.22)	2 (2.04)	6 (6.12)
Student	2 (2.04)	6 (6.12)	3 (3.06)	1 (1.02)
Not working	2 (2.04)	5 (5.10)	1 (1.02)	2 (2.04)
Private employees	2 (2.04)	4 (4.08)	1 (1.02)	4 (4.08)
Civil worker/Soldier	2 (2.04)	3 (3.06)	2 (2.04)	2 (2.04)
Paramedic	1 (1.02)	2 (2.04)	0 (0.00)	2 (2.04)
Other	0 (0.00)	5 (5.10)	1 (1.02)	0

## Discussion

Correlation between allergic rhinitis and rhinosinusitis was not significant. Study conducted in Europe showed similar result.<sup>11</sup> However study in America showed there was significant correlation between allergic rhinitis and chronic rhinosinusitis.<sup>12</sup> This difference might be a result of difference in research design, inclusion criteria, and characteristics of the population.<sup>13</sup>

Nasal mucosal edema in allergic rhinitis patients obstructs the paranasal sinuses' ostiums and leads to mucus retention. Furthermore, there are excessive production of secrete and disruption of the cilia. Mucus retention and disruption of the cilia can interfere with mucociliary clearance.<sup>1,2</sup>

Mucociliary clearance is a mechanism to get rid pathogens and foreign objects out of the body. Respiratory tract has 2 layers of airway surface liquid. The upper layer is a layer of thick mucus consists of mucin secreted by the goblet cell and sub mucosal glands. Pathogens, foreign objects, and debris are trapped in this layer. The lower layer is a periciliary layer consists of thin liquid that surrounds the cilia. This liquid helps the cilia moves faster and coordinately to get the mucus into the oropharynx to either be coughed out or swallowed in.<sup>14</sup> Disruption of this mechanism leads to the inability of clearing out any pathogens, foreign bodies, or debris that trapped in the mucus. This condition facilitates secondary bacterial infection. Moreover, change of normal flora in the paranasal sinuses is found in allergic rhinitis patients.<sup>1,2,15</sup>

On the other hand, Desrosiers et al. (2012) stated that the

role of nasal mucosal edema, obstruction of paranasal sinuses ostiums, mucus retention, and infection in rhinosinusitis were not clear. High eosinophil infiltration was found in both atopic patients and non-atopic patients. Immunoglobulin E production was found in chronic rhinosinusitis patients with or without history of allergy along with negative reactions to allergens in skin prick test.<sup>6</sup> Baroody et al in Feng et al. (2012) claimed that nasal allergen challenge in allergic rhinitis patients induced eosinophilic inflammation of the paranasal sinuses.<sup>2</sup>

Data from a study conducted in the USA showed that prevalence of allergic rhinitis was 20% whereas 50% of the USA population had immunoglobulin E sensitization. This showed that a positive reaction to allergen in skin prick test meant sensitization and could not prove the correlation between allergic rhinitis and rhinosinusitis.<sup>13</sup>

Correlation between allergic rhinitis and rhinosinusitis may be multifactorial. There are many predisposing factors other than allergic rhinitis such as air pollution, anatomic abnormality, genetic, tobacco smoking, viral or bacterial infection, immunodeficiency, biofilm, and gastro esophageal reflux disease.<sup>2</sup> Air pollution, primary ciliary dyskinesia, tobacco smoking, and viral or bacterial infection disrupt the mucociliary clearance. Immunodeficiency and biofilms in polyps facilitate bacterial colonization and infection.<sup>1,16</sup>

Occupation with the biggest proportion in rhinosinusitis was housewives. Exposures to dust was risk factor for chronic rhinosinusitis therefore housework which requires cleaning up dust had relation with rhinosinusitis.<sup>17</sup>

The number of subjects in this study was relatively small

due to limitation of time of data collection. Future study can be improved by distinguishing acute rhinosinusitis from chronic rhinosinusitis, distinguishing intermittent allergic rhinitis from persistent allergic rhinitis, and using sample size calculation.

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### Conclusion

There was no significant correlation between allergic rhinitis and rhinosinusitis. Rhinosinusitis is a multifactorial disease.

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### Conflict of Interest

The author stated there is no conflict of interest.

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