

The Danyoung Classification Correlation with The Severity of Allergic Rhinitis and Symptoms Duration

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Abstract: The Danyoung classification characterizes progressive endoscopic changes in the nasal mucosa of allergic rhinitis (AR) patients, but its clinical correlation with disease severity and chronicity remains unestablished. This cross-sectional study aimed to determine the association between Danyoung stages (1: hypertrophic, 2: dimple, 3: wrinkled) and AR symptomatology. Fifty AR patients from a tertiary allergy-immunology clinic were enrolled over a six-month period. Data on symptom duration, profile, and ARIA-based severity (intermittent/persistent, mild/moderate-severe) were collected. Nasoendoscopic examination was performed for Danyoung staging. Statistical analysis using chi-square tests demonstrated no significant association between Danyoung stage and symptom duration ($p=0.85$) or clinical disease severity ($p=0.96$). The findings indicate that the Danyoung classification, as an objective morphological descriptor, is not a statistically significant predictor of symptom-based AR severity or chronicity in this patient cohort. This suggests that the progression of endoscopic nasal mucosal changes may follow a pathway independent of the clinical parameters defined by ARIA guidelines, limiting its utility as a standalone clinical prognostic tool.

Keywords: Allergy Rhinitis, Allergy Rhinitis Classification, Danyoung Classification

Introduction

Allergic Rhinitis (AR) is an inflammation of the nasal mucosa resulting from the Immunoglobulin E (IgE) mediated allergic reaction (Chang, 2015). It is characterized with symptoms of nasal congestion, clear rhinorrhea, sneezing, and nasal pruritus caused by exposure to certain allergens (Seidman et al., 2015). the prevalence of allergic rhinitis were around 10% - 40%, and trends indicate this number is steadily increasing (Pang et al., 2022).

Research conducted by Chang classified the nasal mucosal changes based on age and gender through an objective visual method in allergic rhinitis patients within a ten years period. It established three stages of mucosal changes, concha hypertrophy (hypertrophic state), dimple-shaped concha (dimple state), and wrinkled concha (wrinkle state) were referred as stage 1, 2

and 3, respectively. Moreover, the results of this study show that there was a correlation between the age and the stage of disease. The Danyoung classification provide a simple and practical evaluation for objective examination of allergic rhinitis from regular endoscopic examination (Chang, 2015, 2018).

The mucosal changes were influenced by histamine release. It stimulates the mucosa on the lateral nasal wall (concha). A repeated stimulation resulted in the mucosal thickening and blood vessels dilation, predominantly in the cavernous plexus. These resulted in the submucosa layer changes, concha edema, plasma cell infiltration, round cells and fibroblasts with the concha cavernous plexus dilation, and smooth muscle atrophies (Bjermer et al., 2019). Furthermore, the histamine was responsible for nasal congestion particularly in high-risk patients who had a family history of atopy, high exposure

to cigarette smoke and vehicle fumes, or having pets and exposed to dust (Kim et al., 2017; Shargorodsky et al., 2017).

The severity of nasal symptoms in allergic rhinitis will be related with the nasal mucosal changes resulted from the allergic reaction. The Danyoung classification for nasal mucosal changes might provide information of the disease severity. Therefore, this study was conducted to explore the association between the Danyoung classification and allergic rhinitis in terms of the severity of allergic rhinitis and the duration of the symptoms (Wise et al., 2023).

Method

A cross-sectional study was conducted from January to June 2023 at the Allergy-Immunology Clinic of the Otorhinolaryngology-Head and Neck Surgery (ORL-HNS) Department, Dr. Saiful Anwar General Hospital, Malang, Indonesia. This design was selected to efficiently evaluate the association between the Danyoung classification and clinical parameters of AR at a single point in time. The study population consisted of consecutive patients diagnosed with Allergic Rhinitis (AR) according to ARIA guidelines who visited the clinic during the study period. The sample size was a total of 50 participants, recruited via a consecutive sampling technique until the target was met.

Inclusion criteria were: (1) adult patients (age ≥ 18 years), (2) confirmed diagnosis of AR, and (3) willingness to undergo nasoendoscopic examination. Exclusion criteria included: (1) a history of nasal surgery or trauma, (2) active sinusitis or nasal polyps, (3) use of intranasal or systemic corticosteroids within the previous four

weeks, and (4) pregnancy. The primary independent variable was the Danyoung classification of nasal mucosal appearance (Stages 1-3). The dependent variables were symptom duration (categorized as <12 months or ≥ 12 months) and disease severity based on ARIA criteria (categorized as mild or moderate-severe). Data were collected using a structured form. Patient characteristics (age, gender) and clinical data (symptom duration, ARIA severity) were obtained through direct interviews and medical record reviews. All participants underwent nasoendoscopic examination by a trained otorhinolaryngologist to assess and assign the Danyoung stage.

Data were analyzed using statistical software (SPSS Statistics for Macbook, Version 28.0). The associations between the Danyoung classification (categorical) and the categorical outcomes (symptom duration and disease severity) were assessed using the Chi-square test. A p-value of less than 0.05 was considered statistically significant.

Results

Patient Characteristics and Disease Profile

A total of 50 patients with allergic rhinitis were included in the study with the mean age of $30,26 \pm 15,61$ years old. There was a higher proportion of women (58%) than men (42%). The highest duration of symptoms > 12 months was found in 82% patients and followed with the duration of 6-12 months and < 6 months for around 14% and 4%, respectively. The detailed demographic and clinical profile of the study participants is presented in Table 1.

Table 1. Characteristics of Patients with Allergic Rhinitis

Variable (N=50)	N (%)
Age, mean $\pm$ std. deviation (years)	30.26 $\pm$ 15.61
Gender, n(%)	
Men	21 (42)
Women	29 (58)
Duration	
< 6 months	2 (4)
6–12 months	7 (14)
> 12 months	41 (82)
Danyoung's Classification, n(%)	

Variable (N=50)	N (%)
Stage 1	22 (44)
Stage 2	22 (44)
Stage 3	7 (12)
Diagnosis, n(%)	
Mild Intermittent Allergic Rhinitis	7 (14)
Moderately Severe Intermittent Allergic Rhinitis	2 (4)
Mild Persistent Allergic Rhinitis	22 (44)
Moderately Severe Persistent Allergic Rhinitis	19 (38)

Association Between Danyoung Classification and Clinical Parameters

The Danyoung's classification stage 1 and 2 were found in 22 patients (44%), and stage 3 in 7 patients (22%). Most of the patients have mild persistent allergic rhinitis followed with moderate-severe persistent allergic rhinitis for 22 patients (44%) and 19 patients (38%), respectively. The symptom duration <6 months were experienced in patients with stage 1 and 2 of Danyoung classification for 4.5%. The longer duration of 6-12 months was found in 18.2% patients with stage 1, 9.1% patients with stage 2 and 16.7% patients with stage 3. The symptom

duration of >12 months, were found in 77.3% patients with stage 1, 86.4% patients with stage 2, and 83.3% with stage 3.

The association of Danyoung's Classification with symptom duration was not statistically significant ($p=0.85$). The mild persistent and moderate-severe persistent allergic rhinitis patients, mostly have a stage 1 (50%) and stage 2 (40.9%) Danyoung classification. There was no significant association between the allergic rhinitis severity with the Danyoung classification ($p = 0.96$). Further details can be seen in Table 2.

Table 2. Association Analysis of Danyoung's Classification with Severity of AR and Duration

	Danyoung's Classification			p
	Stage 1	Stage 2	Stage 3	
Duration, n(%)				
< 6 months	1 (4.5)	1 (4.5)	0 (0)	0.85
6–12 months	4 (18.2)	2 (9.1)	1 (16.7)	
> 12 months	17 (77.3)	19 (86.4)	5 (83.3)	
Severity AR, n(%)				
MIAR	3 (13.6)	3 (13.6)	1 (16.7)	0.96
MSIAR	1 (4.5)	1 (4.5)	0 (0)	
MPAR	11 (50.0)	9 (40.9)	2 (33.3)	
MSPAR	7 (31.8)	9 (40.9)	3 (50.0)	

Abbreviations: MIAR, Mild Intermittent Allergic Rhinitis; MSIAR, Moderately Severe Intermittent Allergic Rhinitis; MPAR, Mild Persistent Allergic Rhinitis; MSPAR, Moderately Severe Persistent Allergic Rhinitis

Discussion

There was a slightly higher number of no significant difference between the number of women than men diagnosed with AR. This might be related to the role of estrogen. The estrogen hormone has a potential effect on every stage of allergic sensitization, such as antigen presentation, T helper 2 (Th2) polarization, IgE

production, and mast cell degranulation via classical estrogen receptors. In an experimental animals research, it was found that estrogen induces the production of IL-5 and IL-13 from mediastinal lymph nodes. Moreover, it is known to induce eosinophil cells in peripheral blood (Bonds & Midoro-Horiuti, 2013).

The ARIA 2008 classified AR based on the duration of symptoms into intermittent (if the

symptoms are less than 4 days/week or less than 4 weeks), and persistent (if the symptoms are more than 4 days/week and more than 4 weeks) (Bousquet et al., 2008). The symptoms of allergic rhinitis was frequently found in primary healthcare by general practitioners before referred into higher healthcare centre for advance treatment by an ENT specialist. Common symptoms of allergic rhinitis include nasal congestion, rhinorrhea, itchy nose, and/or sneezing. The presence of two or more symptoms for more than one hour per day can be classified as suspected allergic rhinitis (Bjermer et al., 2019; Sharma et al., 2022). The mainstay therapy was focused on symptomatic therapy with decongestants and oral antihistamines, which may lead to false assumption of symptom improvement. However, it was essential to identify allergen with allergic testing in order to avoid the corresponding allergen and minimize exposure for further symptoms improvement. IS The severity of allergic rhinitis was determine by the presence of sleep or study disturbances and work disturbance. Moderate severe allergic rhinitis was characterized by the presence of one or more disturbance in daily activity. On the contrary, mild allergic rhinitis was not affect the daily activity (Bousquet et al., 2008). Chronic symptoms (more than 12 months) and interference to daily activity without adequate improvement from medical treatment caused the patients to seek medical treatment from ENT specialist.

Histologically, the allergic reaction results in the thickening of the basement membrane, increased in number of goblet cells, eosinophils and blood vessels with congestion and dilatation, and edema of stromal tissue (Zachreini et al., 2015). I Persistent exposure to allergens will release histamine and stimulate the nasal mucosa, causing mucosal thickening, and blood vessels dilation especially the concha cavernous plexus. Moreover, the structural changes of the mucosal epithelial layer into a stratified cuboid and ciliary loss with subsequent increase in the number of goblet cells. The submucosa layer will become edematous with infiltration of plasma cells, round cells and fibroblasts followed by the cavernous plexus dilation and atrophy of the smooth muscle. The inflammation of the nasal mucosa depends on the duration of exposure to allergen, allergen types and other risk factors.

Early treatment can reduce the recurrent inflammation process in nasal mucosa and slowing the smoot muscle atrophy process in the inferior conchal mucosa (Small et al., 2018; Tran et al., 2011).

We acknowledge that inadequate number of samples in our research might affect the result of this study. Hence, the association between the Danyoung classification with the symptom duration and allergic rhinitis severity have not shown a significant result.

Conclusion

There were no significant association between the Danyoung Classification and the degree of AR ($p=0.96$) and symptom duration ($p=0.85$).

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Disclosure

The author reports no conflicts of interest in this work.

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