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RESEARCH ARTICLE

Effect of nasal irrigation on eosinophil and recurrence in allergic rhinitis

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ABSTRACT

Until now, the treatment of allergic rhinitis has not been satisfactory. Patients with allergic rhinitis are highly dependent on medical pharmacological treatment. Nasal irrigation is expected to help reduce symptoms due to decreased eosinophil counts and recurrence of allergic rhinitis. This study aims to determine the effect of nasal irrigation on eosinophils and the recurrence of allergic rhinitis—experimental research by pre – post-test group design. Twenty samples of allergic rhinitis patients were trained to wash their nose once a day at home—nasal mucosal secretion was collected to count eosinophils before and after intervention. The degree of recurrence was assessed based on the symptoms of nasal congestion, runny nose, sneezing, and itchy nose. The degree is divided into three groups: decrease, remain, and increase. The statistical analysis used in this study for bivariate analysis was Wilcoxon Test. There was a significant decrease in eosinophil count (p = 0.00) and recurrence of nasal congestion (p = 0.00), runny nose (p = 0.00), sneezing (p = 0.001) and itchy nose (p = 0.00) in allergic rhinitis after nasal irrigation intervention. Nasal irrigation treatment can help decrease eosinophil count and recurrence of allergic rhinitis.

1. Introduction

Rhinitis is broadly defined as inflammation of the nasal mucosa. This common disorder affects up to half of the population (Akhouri & House, 2023; Nur Husna *et al.,* 2022). Allergic rhinitis is the most common type of chronic rhinitis, and evidence indicates that the prevalence of this disorder is increasing (Small & Kim, 2011). Symptoms of allergic rhinitis are sneezing, itchy nose, rhinorrhoea, or clear secretions, and symptoms that often cause patients to seek help are intermittent or reversible nasal congestion that can also be spontaneous (Bousquet *et al.,* 2008).

Allergic rhinitis is a health problem with a prevalence reaching 10-30% of the population and still increasing yearly (Pawankar *et al.,* 2013). Eosinophilic inflammation occurs in the nasal mucosa of allergic rhinitis patients. As long as the patient is still exposed to the allergen, the recurrence of allergic rhinitis will continue. Allergic rhinitis medical therapy consists of oral antihistamines and intranasal corticosteroids (Choi, 2019; Novakova *et al.,* 2019). Allergen immunotherapy is an effective immune modulation treatment that should be recommended when pharmacological therapy for allergic rhinitis is ineffective or intolerable. However, this therapy has not been accessible to the broader community (Drazdauskaite *et al.,* 2021; Terada & Kawata, 2022). Corticosteroid therapy also has immunosuppressive and unwanted side effects (Fowler & Sowerby, 2021; Rollema *et al.,* 2022). Eosinophils are essential in allergic reactions, releasing various inflammatory mediators in tissues. The benefit of counting the types of eosinophils in the nasal mucosa is to establish a diagnosis and evaluate therapy for allergic

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rhinitis (Bakhshaee *et al.,* 2010; Sudadi *et al.,* 2019).

Nasal irrigation therapy is an easy adjunctive therapy for treating allergic rhinitis symptoms. Nasal irrigation is an inexpensive nonpharmacological therapy with few side effects (Head *et al.,* 2018). Nasal irrigation therapy has been shown to improve allergic rhinitis symptoms and reduce medication use in allergic rhinitis sufferers. Nasal irrigation can work by cleaning mucus, debris, allergens, and pollutants, reducing inflammatory mediators in the nasal mucosa. Nasal irrigation can also enhance the nose's defense mechanism by increasing the mucociliary transport rate (Hermelingmeier *et al.,* 2012; Principi & Esposito, 2017).

Providing additional nasal irrigation therapy is expected to be a nonpharmacological therapy that improves the symptoms of allergic rhinitis sufferers. This study aims to determine the relationship between nasal irrigation therapy with eosinophil count and the recurrence of allergic rhinitis.

2. Materials and Methods

This experimental research with pre-post design was conducted at the Ear Nose and Throat (ENT) clinic at the Sultan Agung Islamic Hospital in Semarang. This study was approved by the Ethics Committee of the Faculty of Medicine, UNISSULA number 252/VII/2018/Bioethics Committee.

An ENT specialist diagnoses allergic rhinitis patients. The method of sampling in this research is purposive sampling. The total sample in this study was 20 patients. The research subjects were taken smears of nasal mucosal secretions before the intervention and assessed the recurrence before the nasal irrigation intervention. The subjects were taught nasal irrigation and asked to do it daily with normal saline solution, and noted by daily questionnaire, including the recurrence of nasal congestion, runny nose, sneezing, and nasal discharge symptoms. After three months, the patient went to the ENT clinic to get a smear of nasal mucosal secretions, and the researchers collected data on the recurrence of the patient's symptoms for three months. The degree of recurrence and eosinophils were divided into decrease, remain, and increase compared to before intervention.

Data analysis used a numerical scale to look for normality and homogeneity. The pre-post comparison was performed using Mann-Whitney or Wilcoxon analysis with a significance level of 5%.

Table 1. Statistical Test Results Pre - Post of Symptoms Recurrence

Symptoms	*p-value*
Nasal congestion	0,000*a
Runny nose	0,000*a
Sneeze	0,001*a
Itchy nose	0,000*a

*Significant (p < 0,05) Wilcoxon test

Table 2. Number of Allergic Rhinitis Subjects based on Symptoms Recurrence and Eosinophils

Variable	Degrees		
	Decrease (n)	Remain (n)	Increase (n)
Nasal congestion	16	4	0
Runny nose	17	3	0
Sneeze	14	5	1
Itchy nose	17	2	1
Eosinophils	13	2	0

3. Results

The normality and homogeneity test results for both variables showed that they were not normally distributed or homogeneous, so we continued the

Table 3. Pre and Post Eosinophils Count

Sample	Pre	Post
1	0	0
2	1	0
3	1	0
4	1	0
5	1	0
6	1	0
7	1	0
8	1	0
9	2	1
10	2	0
11	2	1
12	1	0
13	0	0
14	1	0
15	1	0
Average	1.067	0,133

Table 4. Mean of Pre and Post-Eosinophils Count

Pre (max-min)	Post (max-min)	Sig
1.07 (0-2)	0.13 (0-1)	0.00

bivariate test with the Wilcoxon test. The statistical test results showed that there were significant differences in the symptoms of nasal congestion, runny nose, sneezing, and itchy nose (*p-value* < 0,05) (Table 1).

The subjects with decreased symptoms of recurrence of nasal congestion, runny nose, sneezing, and itchy nose were 16, 17, 14, and 17 people, respectively (Table 2).

The collection of nasal swab secretions was only taken in 15 out of 20 patients. The eosinophil count was measured pre- and post (Table 3).

Wilcoxon test results showed that eosinophil count was $p = 0{,}000$ ($p < 0{,}05$), and there were significant differences between the number of eosinophils before and after the intervention (Table 4). It was found that 13 people had decreased eosinophil counts, and two people remained (Table 2).

4. Discussion

This study's results align with Head *et al.* (2018) that nasal irrigation with saline could benefit adults and children by reducing the symptoms of allergic rhinitis, and there were no harmful side effects (Head, 2018). Research conducted on Hajj pilgrims in Mecca (2017) showed that the group who washed their noses during ablution had significantly fewer cough symptoms, rhinorrhea, and nasal congestion than those who did not receive the intervention (Ramli *et al.,* 2018). Nasal irrigation with saline is considered a nonpharmacological adjunct to the pharmacological treatment of allergic rhinitis, such as antihistamines and intranasal corticosteroids. In Islam, the term *istinsyaq* means breathing in water into the nose, and *istintsar* is breathing out water from the nose (Yanti *et al.,* 2021). This Islamic approach is similar to the concept of nasal irrigation, which has been applied in various other medical traditions for old practice daily life (Principle & Esposito, 2017).

Nasal irrigation using sodium hyaluronate post-endoscopic sinus surgery conducted on 56 patients in the group that underwent normal saline nasal irrigation and normal saline plus sodium hyaluronate found better endoscopy appearance and patient satisfaction (Mozzanica *et al.,* 2019). Another nasal irrigation study using a hypertonic solution in children found a lower total symptom/treatment score than the group that did not (Mitsias *et al.,* 2020). Nasal irrigation can be used to reduce symptoms of chronic rhinosinusitis allergic rhinitis and to clean a dirty nose due to irritants (Hermelingmeier *et al.,* 2012). In addition, nasal irrigation can increase nasal patency and have minimal side effects. Isotonic saline is thought to have a therapeutic effect by mechanically cleaning the nasal mucosa, improving mucociliary transport, reducing the production of inflammatory mediators, and improving mucosal edema. Lance *et al.* mentioned that isotonic saline can reduce edema by inhibiting the production of prostaglandins and LT4 (Rabago & Zgierska, 2009; Ural *et al.,* 2009). Nasal irrigation with seawater reduced the dose of intranasal corticosteroid use and reduced the number of eosinophils in nasal secretions, which was observed for 12 weeks (Chen *et al.,* 2014). In this study, nasal irrigation using a normal saline solution has a beneficial effect on reducing eosinophil count and recurrence in allergic rhinitis patients.

The limitation of this study was that there was no control group of subjects who did not receive nasal irrigation intervention. Factors influencing this are the limited research samples that come to the hospital ENT clinic and are willing to return for control within the study period.

5. Conclusion

Nasal irrigation showed beneficial effects on reducing eosinophils and the recurrence of allergic rhinitis patients.

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Conflict of interest

All authors have no conflict of interest in this article.

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