J M U H
Journal of Medicine and Urban Health

ORIGINAL ARTICLE

Efficacy of Admixing Azelastine-Fluticasone into Saline Irrigation versus Saline Alone for Allergic Rhinitis: A Randomized Double-Blind Controlled Trial

Pichamol Ouppaphan MD[1], Pisit Wanichakorntrakul MD[2], Alina Santheeraphap MD[1], Phanuwat Wongwatana MD[1], Chairat Niruntrarat MD[1]

[1] *Department of Otolaryngology, Faculty of Medicine, Srinakharinwirot University, Nakhon Nayok 26120, Thailand*

[2] *Department of Otolaryngology, Faculty of Medicine Vajira Hospital, Navamindradhiraj University, Bangkok 10300, Thailand*

Corresponding author
Pisit Wanichakorntrakul
pisit.wan@nmu.ac.th
Received 26 March 2026
Revised 21 May 2026
Accepted 27 May 2026
J Med Urban Health e8369
https://doi.org/10.62691/jmuh.2026.8369

ABSTRACT

Objectives: To determine whether admixing a fixed-dose combination of azelastine hydrochloride and fluticasone propionate (MP-AzeFlu) directly into high-volume saline irrigation provides superior clinical outcomes compared with saline irrigation alone in patients with moderate-to-severe allergic rhinitis (AR).

Materials and Methods: Forty adults with moderate-to-severe AR were randomized (1:1) to the admixture or control group in this prospective, double-blind, randomized controlled trial. The admixture group mixed four actuations of MP-AzeFlu with 120 mL of isotonic saline per irrigation session and performed nasal irrigation twice daily (eight actuations per day; 548 μg azelastine and 200 μg fluticasone per session, for daily totals of 1,096 μg azelastine and 400 μg fluticasone). The control group followed an identical protocol with a matched isotonic saline control spray. Efficacy was assessed using the 22-item Sinonasal Outcome Test (SNOT-22), visual analog scale (VAS), Modified Lund–Kennedy endoscopic score, and acoustic rhinometry at baseline and at 2 and 4 weeks.

Results: Both groups demonstrated statistically significant improvements in SNOT-22 and VAS scores from baseline ($p < 0.001$). However, no statistically significant between-group differences were observed for SNOT-22 (coefficient, 1.06; 95% confidence interval, −2.25 to 4.38; $p = 0.529$), VAS (coefficient, −0.03; 95% confidence interval, −0.85 to 0.79; $p = 0.937$), Modified Lund–Kennedy endoscopic score (coefficient, −0.05; 95% confidence interval, −0.30 to 0.20; $p = 0.700$), or acoustic rhinometry parameters (all $p > 0.05$). No serious adverse events were reported in either group.

Conclusion: In this trial, MP-AzeFlu admixture did not demonstrate a therapeutic advantage over saline irrigation alone. The lack of additive benefit may possibly be attributable to excessive dilution and insufficient mucosal contact time, although the exact mechanism was not directly evaluated in this study. These findings do not support routine use of this off-label admixture protocol. Further comparative studies are needed to determine the optimal delivery strategy for intranasal therapy.

Keywords: admixture, allergic rhinitis, azelastine, fluticasone, nasal irrigation

This work is licensed under a Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International License.

INTRODUCTION

Allergic rhinitis (AR) affects up to 40% of the global population, with a significant effect on quality of life and productivity.[1,2] Intranasal corticosteroids and antihistamines are the cornerstone of pharmacotherapy for AR.[3,4] Nasal saline irrigation is widely recommended as an adjunctive therapy for the mechanical clearance of allergens and inflammatory mediators.[5]

To improve compliance and potentially enhance drug delivery to the paranasal sinuses, some clinicians advocate admixing medications (such as corticosteroids or antibiotics) directly into the saline irrigation bottle.[6,7] Although this practice is common in chronic rhinosinusitis, its efficacy in AR remains debated. Specifically, the combination of azelastine hydrochloride and fluticasone propionate (MP-AzeFlu) has demonstrated superior efficacy as a nasal spray.[8,9] However, whether the pharmacologic advantages of MP-AzeFlu are maintained when the formulation is diluted and administered as a high-volume irrigation admixture remains unknown.

Recent literature has highlighted the importance of delivery methods. Li et al. (2025) recently demonstrated the efficacy of using MP-AzeFlu sequentially with irrigation.[10] The efficacy of admixture technique, which offers greater patient convenience, has not been rigorously tested against saline alone in a blinded manner. In this study, we aimed to evaluate whether admixing MP-AzeFlu into high-volume saline provides superior clinical outcomes compared with saline irrigation alone in patients with moderate-to-severe AR.

MATERIALS AND METHODS

We conducted a prospective, single-center, double-blind, randomized controlled trial at HRH Princess Maha Chakri Sirindhorn Medical Center, Thailand, between February and November 2021. The Institutional Review Board approved the protocol (SWUEC-484/2563F), which was registered with the Thai Clinical Trials Registry (TCTR20210603003). Participants were adults (aged 18–60 years) with moderate-to-severe persistent AR, confirmed by a positive skin-prick test and/or serum allergen-specific IgE. Exclusion criteria included nasal polyps, previous sinonasal surgery, immunodeficiency, or the recent use of systemic steroids.

Participants (n = 40) were randomized 1:1 using computer-generated sequences. Allocation concealment was maintained by sequentially numbered, sealed, opaque envelopes prepared by an independent pharmacist not involved in participant assessment or treatment. Blinding was implemented using identical opaque bottles for both MP-AzeFlu and matched isotonic saline control spray. The matched isotonic saline control spray consisted of isotonic saline in an identical opaque bottle with a similar actuation force and appearance. In order to alleviate the potential for unblinding attributable to the distinctive bitter flavor of azelastine, the active formulation was mixed with 120 mL of isotonic saline (approximately a 1:100 dilution). Although no formal sensory validation of taste masking was performed, no complaints of bitter taste were reported in either group throughout the study period, and no protocol deviations attributed to unblinding were identified. This observation is consistent with the expected taste-masking effect of high-volume dilution; however, the adequacy of blinding cannot be formally confirmed in the absence of a structured taste assessment.

Participants in the admixture group (n = 20) were instructed to actuate four sprays of MP-AzeFlu (Dymista®; Meda Pharmaceuticals) per irrigation session into a 120-mL bottle of isotonic saline, shake gently, and perform nasal irrigation. Participants performed this procedure twice daily, yielding a total daily dose of eight actuations (1,096 μg azelastine hydrochloride and 400 μg fluticasone propionate per day). Participants in the control group (n = 20) followed the same protocol using four sprays of a matched isotonic saline control spray per session, twice daily.

To reduce potential confounding, participants were required to discontinue intranasal corticosteroids, oral antihistamines, leukotriene receptor antagonists, decongestants, and allergen immunotherapy for at least 2 weeks before enrollment (washout period). The use of systemic corticosteroids was an exclusion criterion. Rescue medication (oral cetirizine 10 mg as needed) was permitted but recorded at each visit. Compliance with the washout period and restrictions on concomitant medications was assessed through systematic pill counts and structured patient interviews during each subsequent follow-up appointment. Irrigation adherence was assessed by patient diary cards and bottle weight measurements.

We assessed outcomes at baseline, 2 weeks, and 4 weeks. The primary outcome was the change in Sinonasal Outcome Test (SNOT-22) score. Although SNOT-22 is primarily validated for chronic rhinosinusitis, it has been widely used as an outcome measure in AR trials, including studies by Periasamy et al.[7] and Ishak et al.[11] due to its sensitivity to rhinitis-related symptoms. Given that validated AR-specific quality-of-life instruments (e.g., the Rhinoconjunctivitis Quality of Life Questionnaire [RQLQ]) were not available at our institution, SNOT-22 was selected as the primary endpoint. The minimal clinically

https://doi.org/10.62691/jmuh.2026.8369

important difference (MCID) of 8.9 points was applied with caution, as this threshold was derived from chronic rhinosinusitis populations; the clinical significance of SNOT-22 changes in AR should therefore be interpreted carefully. Secondary outcomes consisted of the visual analog scale (VAS) score for total nasal symptoms, Modified Lund–Kennedy endoscopic score, and acoustic rhinometry (minimum cross-sectional area [MCA]). Safety was monitored via spontaneous reporting and specific inquiry regarding bitter taste, epistaxis, or nasal irritation.

We calculated the sample size to detect a MCID of 8.9 points in SNOT-22 with 80% power. The data were analyzed using an intention-to-treat approach. We used linear mixed-effects models to analyze repeated measures, accounting for group-by-time interactions. A two-sided p-value < 0.05 was considered statistically significant.

RESULTS

We randomized 40 patients (20 per group), and no participants were lost to follow-up (Figure 1). The patients' baseline characteristics, including age (mean, 40.15 vs 42.55 years), sex, and drug allergy history, were comparable between groups (all $p > 0.05$; Table 1). All participants had moderate-to-severe persistent AR confirmed by a positive skin-prick test and/or serum allergen-specific immunoglobulin E assay. No participant had a history of comorbid asthma, whereas 5 participants (12.5%) had a history of comorbid allergic conjunctivitis. Prior to enrollment, all participants had been using intranasal corticosteroids and/or antihistamines; all completed the required 2-week washout period before randomization. Rescue medication use was comparable between groups (MP-AzeFlu admixture group: 3/20 [15%] vs. saline group: 2/20 [10%];

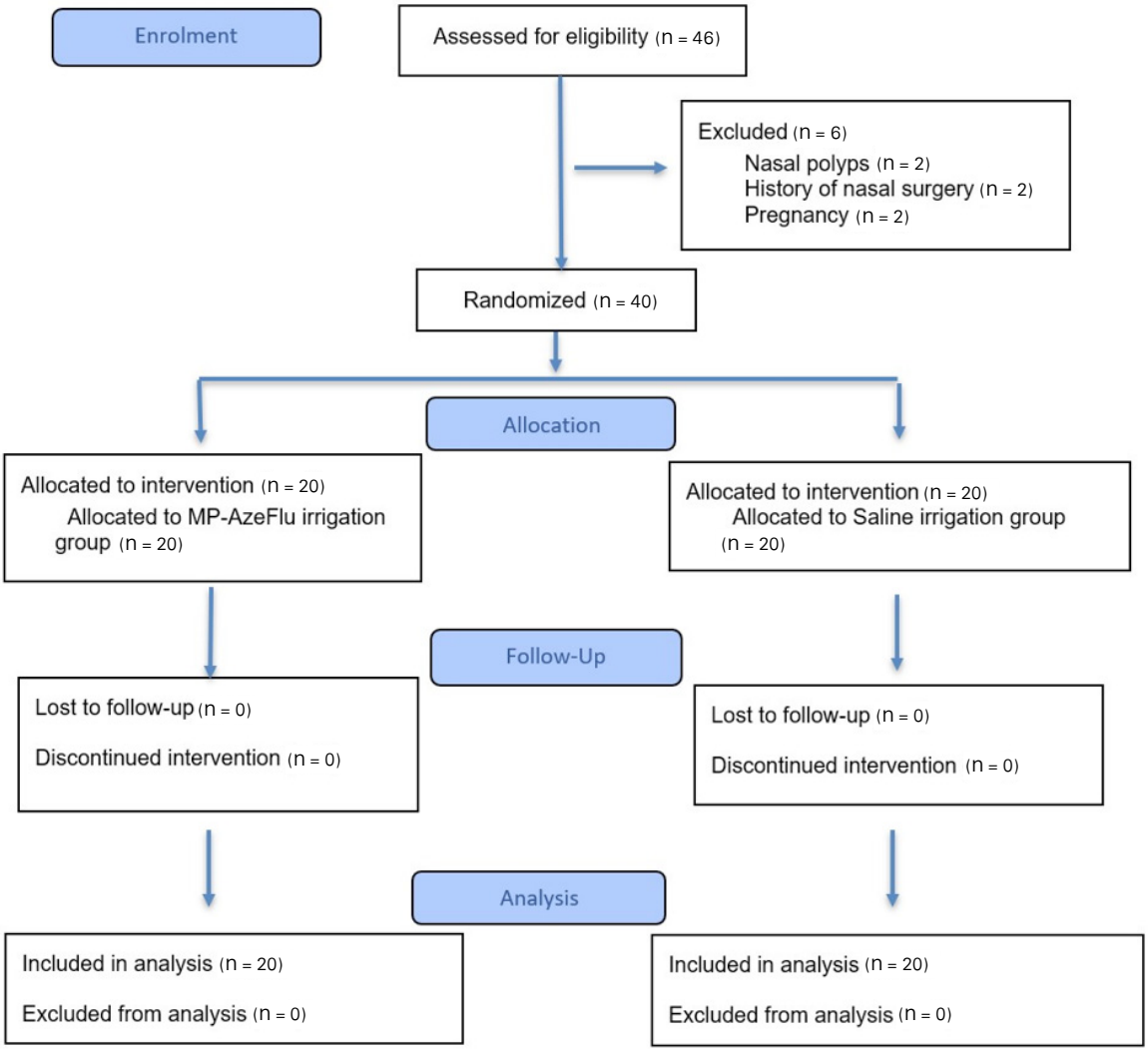


Figure 1 CONSORT Flow Diagram

CONSORT flow diagram illustrates the progression of participants through the trial. Of 46 patients assessed for eligibility, 40 were randomized. Twenty participants were allocated to the MP-AzeFlu irrigation group and 20 to the saline irrigation group. All 40 participants received their allocated intervention and were followed up for the full 4-week duration, with all data included in the final analysis.

p = 1.000). Medication adherence was high in both groups, with mean irrigation adherence rates of 94.5% ± 5.2% in the MP-AzeFlu group and 96.0% ± 4.8% in the saline group (p = 0.352).

Both groups demonstrated significant improvement from baseline in subjective outcomes (Table 2). At week 4, mean SNOT-22 scores decreased by 9.42 points in the saline group and by 9.43 points in the MP-AzeFlu admixture group. However, the improvement in SNOT-22 scores did not differ significantly between groups (coefficient, 1.06; 95% confidence interval, −2.25 to 4.38; p = 0.529). Similarly, VAS scores improved in both groups, with no significant between-group difference (coefficient, −0.03; 95% confidence interval, −0.85 to 0.79; p = 0.937). Modified Lund–Kennedy scores also improved from baseline in both groups, with no significant between-group difference (coefficient, −0.05; 95% confidence interval, −0.30 to 0.20; p = 0.700).

Acoustic rhinometry revealed slight increases in MCA for both groups (Table 3), which is consistent with reduced congestion; however, the differences between the groups were not statistically significant (p > 0.05). No serious adverse events were reported in either group. No participant in either group reported a bitter taste. This finding may be attributable to dilution of the medication in the high-volume irrigation solution; however, formal sensory testing was not performed.

Table 1 Baseline demographics and clinical characteristics of participants

Characteristic	MP-AzeFlu group (n = 20)	Saline group (n = 20)	P-value
Age, years (Mean ± SD)	40.15 ± 10.32	42.55 ± 16.01	0.576
Sex, n (%)			0.752
Male	11 (55.00)	10 (50.00)	
Female	9 (45.00)	10 (50.00)	
History of drug allergy, n (%)			1.000
Yes	5 (25.00)	5 (25.00)	
No	15 (75.00)	15 (75.00)	
AR duration, years (mean ± SD)	6.40 ± 3.82	7.10 ± 4.15	0.541
AR severity (moderate-to-severe persistent), n (%)	20 (100)	20 (100)	—
Baseline SNOT-22 score (mean ± SD)	28.28 ± 8.07	27.21 ± 6.23	0.619
Baseline VAS score (mean ± SD)	5.58 ± 1.69	5.61 ± 1.75	0.950
Comorbid asthma, n (%)	0 (0)	0 (0)	—
Comorbid allergic conjunctivitis, n (%)	3 (15.0)	2 (10.0)	1.000
Positive skin-prick test and/or serum allergen-specific IgE, n (%)	20 (100)	20 (100)	—
Prior intranasal corticosteroid use, n (%)	18 (90.0)	17 (85.0)	1.000
Prior oral antihistamine use, n (%)	14 (70.0)	15 (75.0)	0.733

Abbreviations: AR, allergic rhinitis; IgE, immunoglobulin E; n, number; SD, standard deviation; SNOT-22, 22-item sinonasal outcome test; VAS, visual analog scale

Data are presented as mean ± standard deviation or number (%). P-values were calculated using independent t-test for continuous variables and Fisher's exact test for categorical variables.

https://doi.org/10.62691/jmuh.2026.8369

Table 2 Comparison of cinical outcome scores at baseline, 2 weeks, and 4 weeks

Outcome measure	Group	Baseline (mean ± SD)	Week 2 (mean ± SD)	Week 4 (mean ± SD)	Coefficient (95% CI) / P-value
SNOT-22 score	MP-AzeFlu	28.28 ± 8.07	20.70 ± 6.30	18.85 ± 6.63	1.06 (−2.25, 4.38); p = 0.529
	Saline	27.21 ± 6.23	19.64 ± 5.24	17.79 ± 5.86	
VAS score	MP-AzeFlu	5.58 ± 1.69	3.70 ± 1.55	3.30 ± 1.08	−0.03 (−0.85, 0.79); p = 0.937
	Saline	5.61 ± 1.75	3.74 ± 1.61	3.34 ± 1.26	
Modified Lund–Kennedy	MP-AzeFlu	1.62 ± 0.68	N/A	0.97 ± 0.32	−0.05 (−0.30, 0.20); p = 0.700
	Saline	1.67 ± 0.73	N/A	1.02 ± 0.32	

Abbreviations: CI, confidence interval; N/A, not applicable; SD, standard deviation; SNOT-22, 22-item sinonasal outcome test; VAS, visual analog scale

The coefficient represents the estimated between-group difference in the change from baseline over time, derived from a linear mixed-effects model accounting for group-by-time interactions. A positive coefficient for SNOT-22 indicates a slightly worse outcome in the MP-AzeFlu group compared with saline. Between-group 95% CIs are reported for all outcomes.

Table 3 Comparison of acoustic rhinometry measurements at baseline and 4 weeks

Measurement (mean ± SD)	Group	Baseline	Week 4	Between-group P-value	Mean difference (95% CI) [MP-AzeFlu minus saline]
Distance to MCA, cm (right)	MP-AzeFlu	3.31 ± 0.13	3.40 ± 0.12	0.737	-0.03 (−0.16, 0.10)
	Saline	3.27 ± 0.20	3.39 ± 0.14		
Distance to MCA, cm (left)	MP-AzeFlu	3.25 ± 0.15	3.31 ± 0.12	0.388	-0.09 (−0.25, 0.07)
	Saline	3.21 ± 0.26	3.36 ± 0.18		
MCA, cm^2 (right)	MP-AzeFlu	1.06 ± 0.02	1.10 ± 0.04	0.653	-0.01 (−0.04, 0.02)
	Saline	1.06 ± 0.02	1.11 ± 0.04		
MCA, cm^2 (left)	MP-AzeFlu	1.05 ± 0.02	1.07 ± 0.02	0.126	-0.02 (−0.05, 0.01)
	Saline	1.05 ± 0.02	1.09 ± 0.05		

Abbreviations: cm, centimeter; MCA, minimum cross-sectional area; SD, standard deviation

P-values represent the comparison of the change from baseline between the two groups, calculated using independent t-test. Between-group changes are presented with 95% confidence intervals.

https://doi.org/10.62691/jmuh.2026.8369

DISCUSSION

In this study, admixing MP-AzeFlu into high-volume saline irrigation did not provide superior clinical benefit compared with saline irrigation alone in patients with moderate-to-severe AR. Notably, the saline-only group achieved a mean reduction in SNOT-22 score of 9.42 points, which exceeded the 8.9-point MCID derived from chronic rhinosinusitis populations.[12] Because this threshold has not been validated specifically in AR, the clinical significance of this change should be interpreted cautiously.

Pharmacokinetic principles may offer a plausible explanation for the lack of an additive benefit, although these mechanisms were not directly tested in this study. In a standard nasal spray application, the drug is delivered in a highly concentrated volume that thixotropic nasal sprays are designed to adhere to the mucosa.[9] In our study, two possible mechanisms may contribute to the lack of efficacy:

The standard dose of MP-AzeFlu is formulated with thixotropic agents to promote mucosal retention. When four sprays are mixed with 120 mL of saline per session, the drug is diluted by a factor of more than 100. Although an in vitro study by Roca-Ferrer et al. demonstrated that MP-AzeFlu retained anti-eosinophilic activity at a 1:100 dilution,[13] these effects required prolonged incubation, in contrast to the brief mucosal contact time during nasal irrigation.

High-volume irrigation involves rapid fluid transit, typically over seconds, to mechanically clear mucus. Adequate residence time is required for corticosteroids to exert genomic anti-inflammatory effects and for antihistamines to interact with H1 receptors. Therefore, the admixture technique may reduce the opportunity for drug–receptor interaction because of dilution and rapid washout, unlike nasal spray delivery, which is designed to deposit medication directly onto the nasal mucosa.

Our results differ from prior studies indicating the positive impact of corticosteroid nasal irrigations in AR. Periasamy et al.[7] conducted a randomized, placebo-controlled trial assessing budesonide nasal irrigation versus saline in 52 AR patients, revealing significantly enhanced SNOT-22 ($p = 0.012$) and VAS scores ($p = 0.007$) in the budesonide cohort at 4 weeks. Similarly, Ishak et al.[11] demonstrated that budesonide nasal irrigation significantly improved total SNOT-22 scores and endoscopic findings compared with saline alone in 99 AR patients ($p < 0.001$). These contrasting results may reflect important pharmacological differences between budesonide respules which are formulated specifically for irrigation and contain higher aqueous drug concentrations and the admixture method used in the current study, in which a thixotropic nasal spray formulation was diluted into saline. Budesonide respules maintain physiologically relevant drug concentrations even when diluted, whereas the MP-AzeFlu formulation, designed for direct mucosal contact as a spray, may not preserve adequate drug concentrations or mucosal adhesion properties when further diluted. These differences highlight that the effectiveness of corticosteroid nasal irrigations may depend critically on the formulation type and delivery method rather than on the pharmacological class alone.

In contrast, a recent study by Li et al. (2025) demonstrated that sequential use of saline irrigation followed by standard-dose MP-AzeFlu nasal spray significantly improved outcomes,[10] underscoring the importance of delivery method rather than the drug itself. Our results complement this evidence by showing that convenience-driven admixture protocols may undermine the pharmacologic advantages of combination intranasal therapy.

MP-AzeFlu is a higher-cost therapy than saline irrigation. The present findings raise concerns about the value of using this medication as a high-volume irrigation admixture, although no formal pharmacoeconomic analysis or pharmacokinetic assessment was performed. Further comparative studies are needed to determine whether sequential therapy provides a more effective and cost-efficient delivery strategy.[10,14,15]

The strengths of this study include the rigorous double-blind design with formal allocation concealment, the use of matched isotonic saline control spray, and the high retention rate (100%). Limitations include the single-center setting, relatively small sample size, and the use of SNOT-22 as the primary outcome. Although SNOT-22 is widely used in AR research, it is primarily validated for chronic rhinosinusitis; AR-specific instruments such as the RQLQ or total nasal symptom scores may provide more disease-specific assessments in future studies. The study was also limited by its 4-week follow-up duration, which may not capture longer-term treatment differences. Additionally, the study lacked objective pharmacokinetic assessments (e.g., nasal lavage drug concentrations) to directly confirm the degree of drug absorption, which remains an important avenue for future investigation. Furthermore, detailed sensitization profiles (i.e., specific allergen types) were not systematically recorded, which limits the characterization of the study population and precludes subgroup analyses by sensitization pattern. Finally, formal sensory testing

https://doi.org/10.62691/jmuh.2026.8369

to confirm the adequacy of taste masking was not performed; therefore, the possibility of partial unblinding due to residual taste perception cannot be entirely excluded.

CONCLUSION

Admixing azelastine–fluticasone into high-volume saline irrigation provides no additional clinical benefit over saline irrigation alone for adults with moderate-to-severe AR. Marked dilution and brief mucosal contact time may have limited the pharmacologic activity of this fixed-dose nasal spray formulation, although these mechanisms were not directly evaluated. These findings contrast with those from budesonide-based irrigation studies, which may reflect formulation-specific differences rather than a class effect. The present findings do not support routine use of this off-label admixture protocol. Larger, multicenter studies with pharmacokinetic assessments and AR-specific outcome measures are needed to determine the optimal delivery strategy for intranasal therapy.

Conflict of Interest

The authors declare no conflicts of interest.

Acknowledgments

The authors thank all participants who volunteered for this study and the nursing staff at HRH Princess Maha Chakri Sirindhorn Medical Center for their assistance. During the preparation of this manuscript, the authors used Microsoft Editor solely for language editing, grammar improvement, and readability enhancement. The authors reviewed and edited all AI-generated or AI-assisted text and take full responsibility for the content, accuracy, and scientific integrity of the final manuscript.

Author Contributions

Conceptualization: P.O., P.W.
Data curation: P.O., A.S., P.W.
Formal analysis: P.W., C.N.
Funding acquisition: —
Investigation: P.O., A.S., P.W.
Methodology: P.O., P.W.
Project administration: P.O.
Resources: P.O., P.W.
Software: P.W., C.N.
Supervision: P.W., C.N.
Validation: P.O., P.W., C.N.
Visualization: P.W.
Writing – original draft preparation: P.W.
Writing – review & editing: P.O., P.W., A.S., Ph.W., C.N.

Data Availability Statement

The datasets generated and analyzed during the current study are available from the corresponding author on reasonable request.

REFERENCES

1. Dierick BJH, van der Molen T, Flokstra-de Blok BMJ, Muraro A, Postma MJ, Kocks JWH, et al. Burden and socioeconomics of asthma, allergic rhinitis, atopic dermatitis and food allergy. Expert Rev Pharmacoecon Outcomes Res 2020;20(5):437–53. PUBMED | CROSSREF
2. Bunnag C, Jareoncharsri P, Tantilipikorn P, Vichyanond P, Pawankar R. Epidemiology and current status of allergic rhinitis and asthma in Thailand -- ARIA Asia-Pacific workshop report. Asian Pac J Allergy Immunol 2009;27(1):79–86.
3. Brozek JL, Bousquet J, Agache I, Agarwal A, Bachert C, Bosnic-Anticevich S, et al. Allergic rhinitis and its impact on asthma (ARIA) guidelines-2016 revision. J Allergy Clin Immunol 2017;140(4):950–8. PUBMED | CROSSREF
4. Seidman MD, Gurgel RK, Lin SY, Schwartz SR, Baroody FM, Bonner JR, et al. Clinical practice guideline: Allergic rhinitis. Otolaryngol Head Neck Surg 2015;152(1 Suppl):S1–43. PUBMED | CROSSREF
5. Head K, Snidvongs K, Glew S, Scadding G, Schilder AG, Philpott C, et al. Saline irrigation for allergic rhinitis. Cochrane Database Syst Rev 2018;6(6):CD012597. PUBMED | CROSSREF
6. Harvey RJ, Snidvongs K, Kalish LH, Oakley GM, Sacks R. Corticosteroid nasal irrigations are more effective than simple sprays in a randomized double-blinded placebo-controlled trial for chronic rhinosinusitis after sinus surgery. Int Forum Allergy Rhinol 2018;8(4):461–70. PUBMED | CROSSREF
7. Periasamy N, Pujary K, Bhandarkar AM, Bhandarkar ND, Ramaswamy B. Budesonide vs saline nasal irrigation in allergic rhinitis: a randomized placebo-controlled trial. Otolaryngol Head Neck Surg 2020;162(6):979–84. PUBMED | CROSSREF
8. Carr W, Bernstein J, Lieberman P, Meltzer E, Bachert C, Price D, et al. A novel intranasal therapy of azelastine with fluticasone for the treatment of allergic rhinitis. J Allergy Clin Immunol 2012;129(5):1282–9.e10. PUBMED | CROSSREF
9. Derendorf H, Munzel U, Petzold U, Maus J, Mascher H, Hermann R, et al. Bioavailability and disposition of azelastine and fluticasone propionate when delivered by MP29-02, a novel aqueous nasal spray. Br J Clin Pharmacol 2012;74(1):125–33. PUBMED | CROSSREF
10. Li S, Xu R, Yu S, Wang M, Fan J, Chen M, et al. Nasal saline irrigation with azelastine-fluticasone nasal spray in moderate-to-severe persistent allergic rhinitis: a randomized controlled trial. Front Allergy 2025;6:1622510. PUBMED | CROSSREF
11. Ishak MN, Md Shukri N, Ramli RR. The effectiveness of Budesonide nasal irrigation in patients with allergic rhinitis. Malays J Med Sci 2022;29(1):34–42. PUBMED | CROSSREF
12. Chowdhury NI, Mace JC, Bodner TE, Alt JA, Deconde AS, Levy JM, et al. Investigating the minimal clinically important difference for SNOT-22 symptom domains in surgically managed chronic rhinosinusitis. Int Forum Allergy Rhinol 2017;7(12):1149–55. PUBMED | CROSSREF

13. Roca-Ferrer J, Pujols L, Perez-Gonzalez M, Alobid I, Callejas B, Vicens-Artes S, et al. Superior effect of MP-AzeFlu than azelastine or fluticasone propionate alone on reducing inflammatory markers. Allergy Asthma Clin Immunol 2018;14:86. PUBMED | CROSSREF
14. Shah S, Berger W, Lumry W, La Force C, Wheeler W, Sacks H. Efficacy and safety of azelastine 0.15% nasal spray and azelastine 0.10% nasal spray in patients with seasonal allergic rhinitis. Allergy Asthma Proc 2009;30(6):628–33. PUBMED | CROSSREF
15. Chong LY, Head K, Hopkins C, Philpott C, Glew S, Scadding G, et al. Saline irrigation for chronic rhinosinusitis. Cochrane Database Syst Rev 2016;4(4):CD011995. PUBMED | CROSSREF

https://doi.org/10.62691/jmuh.2026.8369