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RESEARCH ARTICLE
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A COMPARATIVE STUDY BETWEEN THE EFFICACY OF INTRANASAL STEROID VERSUS A COMBINATION OF INTRANASAL STEROID WITH NASAL SALINE IRRIGATION IN THE MANAGEMENT OF ALLERGIC RHINITIS IN CHILDREN.

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ABSTRACT

BACKGROUND:
Allergic rhinitis is a prevalent condition in children that significantly affects quality of life. Intranasal steroids are a commonly prescribed treatment, but their efficacy can be limited in some cases. This study evaluates whether the combination of intranasal steroid with nasal saline irrigation provides superior symptom relief compared to intranasal steroid alone.

METHODS:
A prospective cohort study was conducted at RVM Hospital, involving 80 pediatric patients diagnosed with moderate to severe allergic rhinitis. Participants were divided into two groups: Group A (intranasal steroid therapy) and Group B (intranasal steroid therapy combined with nasal saline irrigation). Symptom severity was assessed using the Treatment total nasal symptom (TNSS) at baseline and one-month follow-up. Statistical analyses were performed to determine the efficacy of the two treatments.

RESULTS:
Post treatment TNSS were significantly lower in Group B (3.65 ± 1.001) compared to Group A (5.95 ± 1.358, $p < 0.001$), demonstrating greater symptom improvement in the combination therapy group. Significant reductions were observed in nasal congestion ($p < 0.001$), sneezing ($p < 0.001$),

runny nose ($p = 0.002$), and sleep disturbances ($p < 0.001$) in Group B compared to Group A. These findings suggest that nasal saline irrigation enhances the effectiveness of intranasal steroids.
CONCLUSION: The combination of intranasal steroid and nasal saline irrigation provides superior symptom control compared to intranasal steroid alone, making it a reliable treatment option for pediatric allergic rhinitis. Future research should focus on long-term adherence and effectiveness across broader populations.

Keywords: Allergic rhinitis, intranasal steroid, nasal saline irrigation, pediatric, Total Nasal Symptom Score (TNSS), symptom relief.

Introduction:
Allergic rhinitis, which predominantly manifests as an inflammatory condition of the nasal mucosa, is characterized by a constellation of symptoms including, but not limited to, sneezing, nasal obstruction, pruritus of the nasal passages, and rhinorrhea. It is pertinent to emphasise that allergic rhinitis, in isolation, is typically not considered life-threatening, except in cases where it coexists with severe asthma or anaphylactic reactions [1].
Allergic rhinitis constitutes a persistent atopic condition marked by recurring symptoms, particularly upon exposure to environmental triggers such as particulate matter, smoke, and fungal agents [2]. Severe allergic rhinitis correlates with significant detriments in quality of life, sleep patterns, and occupational performance [3]. Though not life-threatening on its own, it can significantly impair quality of life, especially when associated with asthma. It is triggered by environmental factors and is now recognized as a systemic airway disorder [4].
Over the last two decades, the prevalence of allergic rhinitis shows increasing trend in India, especially among children aged 13–14 years. International study of asthma and Allergies in childhood (ISAAC), shows a rise in nasal symptoms and rhinoconjunctivitis. Nasal symptoms were reported in 12.5% and 18.6% of 6–7 and 13–14-year-old children, respectively, in ISAAC Phase I, and in 12.9% and 23.6% in ISAAC Phase III, where 70–80% of Indian patients with asthma also have allergic rhinitis. Indian data reports ~22% adolescents and ~9.8% adults affected, though rural areas may be underreported due to lack of data [5,6].

According to ARIA guidelines, allergic rhinitis is categorized based on duration and severity. Mild symptoms are those that do not interfere with sleep or daily activities. Symptoms are classified as moderate to severe if they significantly disrupt sleep, daily functioning, or are perceived as particularly bothersome.

- **Duration:** Intermittent (<4 days/week or <4 weeks) vs. Persistent (>4 days/week and >4 weeks)
- **Severity:** Mild (no disruption of daily life) and Moderate/Severe (affecting sleep and function) [4,7]

Treatment modality as per allergic rhinitis and its impact on asthma (ARIA) guidelines stated that, in mild cases second-generation antihistamines are preferred, moderate to severe cases inhaled nasal steroids (e.g., mometasone, fluticasone furoate) are first-line, especially in children over two years. Decongestants are not recommended for children due to side effects. Intranasal antihistamines are often avoided in children because of unpleasant taste and sedation [6].
Allergic rhinitis disrupts sleep and daily life, especially in children. Although intranasal steroids are common treatment, many still suffer symptoms. Exploring combination therapies is essential to improve outcomes. The study investigates the added benefit of nasal saline irrigation alongside intranasal steroids in children. It aims to assess symptom improvement using the TNSS and patient-reported outcomes, to help refine and improve treatment protocols.

Research Question: Does combining nasal saline irrigation with intranasal steroids improve allergic rhinitis management in children compared to using intranasal steroids alone, in terms of symptom severity and overall outcomes?

Aim

1. To evaluate the effect of combining nasal saline irrigation with intranasal steroid in the management of allergic rhinitis.

Objectives

1. To compare the effectiveness of intranasal steroid alone versus combination therapy.
2. To evaluate whether the treatments would significantly reduce symptoms based on the TNSS.

Methodology: A prospective cohort study was conducted in the department of paediatrics at RVM Hospital (RVM Institute of Medical Sciences and Research center), located in Laxmakkapally village, Mulugu mandal, Siddipet district, Telangana state for a period of 6 months. Study participants included 80 paediatric patients.

Inclusion Criteria

- Children aged 6 to 18 years presenting with symptoms of allergic rhinitis. For this study, the operational definition of the pediatric age group follows the classifications by UNICEF, NIH, AAP, and FDA, which define pediatric care as encompassing individuals aged 6 to 18 years [8].
- Patients diagnosed with moderate to severe allergic rhinitis.
- Informed consent obtained from a parent or legal guardian.

2.1.2 *Exclusion Criteria*

- Patients with coexisting conditions such as URTI, sinusitis, ethmoidal or antrochoanal polyps, asthma, cystic fibrosis, or immunodeficiency.
- Patients with a history of nasal surgery.
- Patients with only mild symptoms of allergic rhinitis.
- Patients unwilling to attend follow-up appointments.
- Use of oral or intranasal corticosteroids, antihistamines, or leukotriene inhibitors within one month before enrollment.
- Patients or guardians unwilling to provide informed consent.

Sampling methods: purposive sampling method was used.

STUDY GROUPING:

Children meeting the inclusion criteria were enrolled, and symptom severity was assessed using the TNSS at baseline. They were grouped as follows:

- **Group A:** Treated with intranasal steroid spray (fluticasone furoate) – 40 patients.
- **Group B:** Treated with a combination of intranasal saline irrigation and steroid therapy– 40 patients.

2.2 DATA COLLECTION AND OUTCOME MEASURES

Patient data, including demographics, medical history, and clinical assessments, were collected. Symptom severity was evaluated using the TNSS, a validated scoring tool [9,10].

- **Primary outcome:** Change in TNSS from baseline to the 1-month follow-up.
- **Secondary outcomes:** Patient-reported symptom relief and clinical response.

A total of 80 data collection forms were initially distributed, with participants equally divided into two groups: one receiving intranasal corticosteroid alone (Group A) and the other receiving a combination of intranasal corticosteroid and nasal saline irrigation (Group B). Although there were some initial participant dropouts in both groups, additional eligible children were recruited to maintain the target sample size for each group. As a result, completed forms were successfully collected from all participants, ensuring a balanced and full sample from both groups.

The TNSS Forms were administered at two time points—prior to the initiation of treatment (baseline) and again after one month of therapy. These forms served to evaluate the severity of symptoms and the overall effectiveness of the treatments.

Development and validation of documentation form:
Key guidelines and resources for evaluating allergic rhinitis symptoms in children were reviewed to determine essential components for the documentation form. Input from pediatricians and pharmacy practice experts helped refine the form to ensure it effectively captured patient demographics, medical history, diagnostic test results, TNSS, and treatment responses.

Ethical considerations:
The study received approval from the Institutional Review Board (IRB) prior to initiation. Ethical clearance was granted on 27/08/2024, with reference number: GCPK/PD24/11. Patient confidentiality was strictly maintained, and the study adhered to ethical principles outlined in the Declaration of Helsinki.

Statistical analysis:
Data were analysed using SPSS software, version 27.0.

- Frequency and percentage were used for qualitative variables.
- Mean and standard deviation were calculated for quantitative variables.
- The Chi-square test was used to assess associations between categorical variables.
- The independent sample t-test was employed to compare quantitative variables between the two groups.

A p-value of less than 0.05 was considered statistically significant.

Results:
The results of this study highlight the comparative efficacy of intranasal steroid alone versus its combination with nasal saline irrigation in managing allergic rhinitis in children. Various parameters, including TNSS, nasal congestion, sneezing, and sleep difficulty, were assessed pre- and post-treatment in both groups.

Mean age of participants in Group A (steroid therapy) and Group B (combination therapy) were similar (11.33 ± 3.689 years in Group A vs. 10.80 ± 3.204 years in Group B), with no statistically significant difference ($p = 0.499$). This indicates that age distribution did not influence treatment outcomes, ensuring comparability between groups. Group A had 22 males (47.8%) and 18 females (52.9%), whereas Group B included 24 males (52.2%) and 16 females (47.1%). The relatively similar gender distribution among both Groups serves to reduce gender-related bias in the Treatment response. (shown in table 1)

Table 01: comparison of age in years between group a and group b

Sociodemographic variables		Group A	Group B	Total	X^2 or t test / p value
Age in years	Mean	11.33	10.8	11.01	t =0.68 / p -0.499
	SD	3.689	3.204	3.45	
	N	40	40	80	
Gender	Male	22 (47.8%)	24(52.2%)	46(57.5%)	X^2 = 5.18/ p -0.27
	Female	18(52.9%)	16(47.1%)	34(42.5%)	

Symptom severity distribution across both groups revealed the following:

- **Nasal Congestion:** Severe in 66.3% of participants, with no significant difference between groups (p = 0.725).
- **Runny Nose:** Severe in 63.8% of participants, with a slightly higher incidence in Group B with no significant difference between groups (p = 0.112).
- **Nasal Itching:** Most commonly reported as moderate, with no significant difference between groups (p = 0.354).
- **Sneezing:** Severe in 35.0% of participants, with a slightly higher incidence in Group A (p = 0.267).
- **Difficulty Sleeping:** Reported as moderate by 42.5% of participants, with an even distribution between groups (p = 0.697).
- Among Participants in Group A, 44.7% experienced moderate to extreme symptoms, while 55.3% of Group B reported similar severity. Conversely, 54.8% of Group A and 45.2% of Group B presented with severe symptoms. The p-value of 0.370 indicates that there is no statistically significant difference in overall symptom severity between the two groups at baseline.

The majority of participants exhibited moderate to severe symptoms across all categories, with no statistically significant difference indicating that both groups were comparable prior to treatment.(shown in table 2)

Table 2: Distribution by Pretreatment TNSS magnitude in Group A versus Group B

		PRE-TREATMENT				TOTAL		CHI- SQUARE	P VALUE
		GROUP A		GROUP B					
		No.	%	No.	%	No.	%		
NASAL CONGESTION	MILD	4	50	4	50	8	10.0	0.643	0.725
	MODERATE	8	42	11	58	19	23.8		
	SEVERE	28	53	25	47	53	66.3		
RUNNY NOSE	MILD	4	67	2	33	6	7.5	4.385	0.112
	MODERATE	15	65	8	35	23	28.8		
	SEVERE	21	41	30	59	51	63.8		
NASAL ITCHING	NONE	2	40	3	60	5	6.3	3.254	0.354
	MILD	15	60	10	40	25	31.3		
	MODERATE	12	39	19	61	31	38.8		
	SEVERE	11	58	8	42	19	23.8		
SNEEZING	NONE	2	50	2	50	4	5.0	3.952	0.267
	MILD	9	38	15	63	24	30.0		
	MODERATE	11	46	13	54	24	30.0		
	SEVERE	18	64	10	36	28	35.0		
DIFFICULT SLEEP	NONE	2	29	5	71	7	8.8	1.438	0.697
	MILD	15	52	14	48	29	36.3		
	MODERATE	18	53	16	47	34	42.5		
	SEVERE	5	50	5	50	10	12.5		

Over all score	NONE	0	0	0	0	0	0		
	MILD	0	0	0	0	0	0		
	MODERATE	17	44.7	21	55.3	38	47.5	0.802	0.370
	SEVERE	23	54.8	19	45.2	42	52.5		

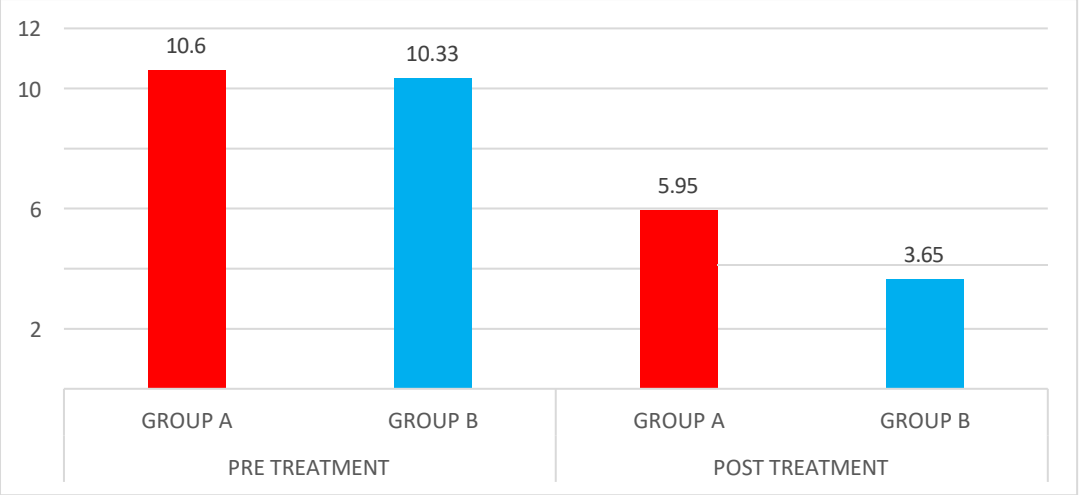
- **Nasal Congestion:** Mild symptoms were more common in Group B (73%), while moderate congestion persisted in 89% of Group A ($p < 0.001$).
- **Runny Nose:** Moderate symptoms remained in 78% of Group A, but only 22% of Group B ($p = 0.005$).
- **Nasal Itching:** Moderate symptoms persisted only in Group A ($p = 0.007$).
- Sneezing: Moderate symptoms were still present in 88% of Group A, but only 12% of Group B ($p < 0.001$).
- **Difficulty Sleeping:** Moderate symptoms were reported only in Group A, with Group B showing significantly greater improvement ($p = 0.003$).
- After treatment, 76.5% of Group B reported mild symptoms, compared to only 23.5% in Group A ($p < 0.001$).
- Additionally, 96.6% of Group A continued to experience moderate symptoms, whereas this was true for only 3.4% of Group B. These findings confirm that intranasal steroid + nasal saline irrigation resulted in significantly greater symptom relief compared to intranasal steroid alone. (shown in table 3)

Table 3: Distribution by Post-treatment TNSS magnitude in Group A versus Group B

		POST TREATMENT				TOTAL		Chi-square	P value
		GROUP A		GROUP B					
		No.	%	No.	%	No.	%		
NASAL CONGESTION	NONE	4	44	5	56	9	11.3	25.535	**<0.001**
	MILD	12	27	32	73	44	55.0		
	MODERATE	24	89	3	11	27	33.8		
RUNNY NOSE	NONE	3	30	7	70	10	12.5	10.671	**0.005**
	MILD	19	40	28	60	47	58.8		
	MODERATE	18	78	5	22	23	28.8		
NASAL ITCHING	NONE	7	35	13	65	20	25.0	9.877	**0.007**
	MILD	25	48	27	52	52	65.0		
	MODERATE	8	100	0	0	8	10.0		
SNEEZING	NONE	10	31	22	69	32	40.0	14.473	**<0.001**
	MILD	15	48	16	52	31	38.8		
	MODERATE	15	88	2	12	17	21.3		
DIFFICULT SLEEP	NONE	7	28	18	72	25	31.3	11.35	**0.003**
	MILD	27	55	22	45	49	61.3		
	MODERATE	6	100	0	0	6	7.5		
Over all score	NONE	0	0	0	0	0	0	39.43	<0.001
	MILD	12	23.5	39	76.5	51	63.8		
	MODERATE	28	96.6	1	3.4	29	36.3		
	SEVERE	0	0	0	0	0	0		

- **Pre-Treatment TNSS:** Scores were comparable between the two groups — 10.60 ± 1.630 in Group A and 10.33 ± 1.185 in Group B ($p = 0.391$; not statistically significant).
- **Post-Treatment TNSS:** A significantly greater reduction was observed in Group B (3.65 ± 1.001) compared to Group A (5.95 ± 1.358) ($p < 0.001$) (shown in figure 1).

Figure 1: COMPARISON OF TNSS PRE & POST-TREATMENT BETWEEN GROUP A & GROUP B



- **Pre-Treatment:** Both groups had comparable symptom severity (Group A: 10.60, Group B: 10.33).
- **Post-Treatment:** TNSS decreased in both groups; however, Group B showed a significantly greater reduction (64.67%) compared to Group A (43.86%).

These findings confirm that the intranasal steroid + nasal saline irrigation combination (Group B) was more effective in reducing allergic rhinitis symptoms than intranasal steroid alone (Group A).

Table 4: comparison of mean clinical symptoms scores percentage reduction in group A & group B

	GROUP A		GROUP B	
	Mean	% Reduction	Mean	% Reduction
Pre- treatment	10.6	-	10.33	-
Post - treatment	5.95	43.86%	3.65	64.67%

Patients who received both intranasal steroid and nasal saline irrigation (Group B) showed a significantly greater reduction in TNSS scores compared to those receiving steroid alone (Group A). Post-treatment TNSS scores in Group B averaged 3.65 ± 1.001, whereas Group A had an average of 5.95 ±1.358 ($p < 0.001$).(shown in table 4)

Discussion: The present study evaluated the efficacy of intranasal steroid therapy alone versus a combination of intranasal steroids and nasal saline irrigation in managing allergic rhinitis among children. The findings revealed that while both treatment modalities resulted in symptomatic improvement, the combination therapy (Group B) significantly outperformed steroid monotherapy (Group A) across multiple parameters, particularly in reduction of TNSS, nasal congestion, sneezing, and sleep disturbances.

These findings are consistent with those of **Smitha Soubhagya et al. (2021)**, the efficacy of three treatment modalities for allergic rhinitis was evaluated: intranasal steroid spray, isotonic saline nasal irrigation, and combination therapy. The mean TNSS before treatment were 13.72, 12.96, and 13.68 for groups A, B, and C, respectively. After one month of treatment, the scores decreased to 8.28, 8.76, and 3.72, respectively. The findings indicate that the combined use of saline nasal irrigation and intranasal corticosteroids is more effective in reducing symptoms compared to either therapy used individually. Our study similarly demonstrated a 64.67% reduction in TNSS in the

combination group compared to 43.86% in the steroid-only group, reaffirming the benefit of adjunctive nasal irrigation[11].

In alignment with **Dong Luo et al. (2019)**, Among the 40 patients enrolled, the mRQLQ scores, which reflect quality of life, showed a significant reduction ($p \sim 0.001$) with twice-daily nasal irrigation using isotonic saline. Scores decreased from 36.7–20.48 at baseline to 14.9–11.03 at 4 weeks and further to 10.10–10.65 at 8 weeks. No significant differences were observed in adverse events, nasal steroid usage patterns, or NPIF. Luo's meta-analysis established that saline irrigation acts synergistically with corticosteroids, enhancing therapeutic efficacy—findings which are mirrored in our improved post-treatment scores in Group B[12].

Similarly, **Shaun A. Nguyen et al. (2014)** concluded that nasal saline irrigation is both safe and beneficial as an adjunct treatment for allergic rhinitis. Twice-daily nasal irrigation with isotonic saline significantly reduced mRQLQ scores from 36.7 ± 20.48 at baseline to 14.9 ± 11.03 at 4 weeks and further to 10.10 ± 10.65 at 8 weeks ($p < 0.001$). However, no significant changes were observed in NPIF, nasal steroid usage patterns, or adverse events The significant reductions in nasal congestion and sneezing in our study's combination group echo Nguyen's conclusions, particularly regarding symptom-specific improvement and enhanced tolerability in pediatric populations[13].

Stefani Madison et al. (2016) also supported the integration of nasal saline irrigation into standard allergic rhinitis care protocols. The main findings demonstrated clinical significance, as decreased eosinophils in nasal secretions were observed in the combination group (intranasal steroid and nasal saline irrigation) compared to saline alone or intranasal steroids alone ($p < 0.05$) after 8 and 12 weeks. [14].

Additionally, **Y. Wang et al. (2020)** emphasized the immunomodulatory benefits of saline irrigation, including the dilution of allergens and reduction in pro-inflammatory mediators in the nasal mucosa. The study concluded that nasal saline irrigation significantly improves local symptoms of allergic rhinitis in both children and adults. However, for adults with allergic rhinitis, steroid nasal sprays are more effective than saline irrigation alone, and the combination of saline irrigation and medication is superior to medication alone. This mechanistic insight may explain the significantly greater symptom resolution observed in our combination therapy group, particularly in sleep difficulty and nasal itching [15].

Whereas study by Nikitha Perisamy et al. assessed the subjective and clinical responses to budesonide-buffered hypertonic saline nasal irrigation and hypertonic saline nasal irrigation in patients with allergic rhinitis. Both groups showed significant improvements in all scores ($P < .001$). The budesonide irrigation group demonstrated significantly greater improvement in SNOT-22 scores ($P = .012$) and VAS scores ($P = .007$) compared to the saline irrigation group. However, the difference in clinical response between the two groups was not statistically significant ($P = .268$). The study concluded that saline nasal irrigation is effective in managing allergic rhinitis and that the addition of budesonide enhances its efficacy, making budesonide nasal saline irrigation a viable treatment option for allergic rhinitis [16].

Importantly, both groups in our study had comparable pre-treatment symptom severity, with no statistically significant differences in baseline TNSS or demographic variables. This comparability strengthens the reliability of our findings and suggests that the observed improvements are attributable to the intervention itself rather than to confounding factors.

In contrast to some earlier reservations about the acceptability of nasal irrigation in children due to discomfort or compliance concerns, our findings support its practicality and tolerability when properly administered. This supports previous reports that nasal irrigation, when used with child-friendly devices and under supervision, can be an effective, well-tolerated adjunct in pediatric care.

CONCLUSION

This study confirms that the combination of intranasal corticosteroid therapy and nasal saline irrigation is more effective in alleviating the symptoms of allergic rhinitis in children when compared to intranasal corticosteroid therapy alone. Participants in Group B (combination therapy) showed greater improvement in nasal congestion, sneezing, runny nose, and sleep quality.

Based on these findings, nasal saline irrigation should be considered a valuable adjunct to intranasal corticosteroid therapy, potentially warranting a revision of current clinical guidelines for the management of allergic rhinitis. Future research should focus on evaluating long-term patient compliance, the effectiveness of this combination therapy across diverse populations, and determining the optimal saline concentration necessary to maximise therapeutic outcomes.

STRENGTHS

1. Objective Symptom Assessment: The use of the TNSS Score (TNSS) provided a standardised method for assessing symptom severity, ensuring reliable data collection.

2. Clinical Relevance: The study findings have direct implications for improving allergic rhinitis treatment guidelines, particularly in pediatric patients.

LIMITATIONS

1. Short Follow-Up Duration: The study followed patients for only one month, limiting insights into the long-term efficacy and sustainability of treatment effects.

2. Limited Sample Size: With only 80 patients enrolled, the sample size was relatively small, which may limit the generalizability of the findings to larger populations.

3. Single-Centre Study: The study was conducted at one tertiary care hospital, reducing its applicability to broader demographic and geographical populations.

4. Lack of Long-Term Adherence Data: The study did not assess long-term adherence to saline irrigation, which could influence real-world effectiveness.

5. Potential for Patient Variability: Differences in patient compliance, lifestyle factors, and environmental exposure to allergens may have influenced symptom resolution, which was not accounted for in the study.

References:

1. Varshney J, Varshney H. Allergic rhinitis: an overview. Indian Journal of Otolaryngology and Head & Neck Surgery. 2015 Jun;67:143-9.
2. Alnahas S, Abouammoh N, Althagafi W, Abd-Ellatif EE. Prevalence, severity, and risk factors of allergic rhinitis among schoolchildren in Saudi Arabia: A national cross-sectional study, 2019. World Allergy Organization Journal. 2023;16(10):100824.
3. Head K, Snidvongs K, Glew S, Scadding G, Schilder AG, Philpott C, Hopkins C. Saline irrigation for allergic rhinitis. Cochrane Database Syst Rev. 2018 Jun 22;6(6):CD012597. doi: 10.1002/14651858.CD012597.pub2. PMID: 29932206; PMCID: PMC6513421.
4. Trangsrud AJ, Whitaker AL, Small RE. Intranasal corticosteroids for allergic rhinitis. Pharmacotherapy. 2002 Nov;22(11):1458-67. doi: 10.1592/phco.22.16.1458.33692. PMID: 12432972.
5. AR CAN CAUSEN Mir E, Panjabi C, Shah A. Impact of allergic rhinitis in school-going children. Asia Pacific Allergy. 2012 Apr;2(2):93-100
6. Garavello, W., Romagnoli, M., Sordo, L., Gaini, R. M., & Di Berardino, F. (2003). Hypersaline nasal irrigation in children with symptomatic seasonal allergic rhinitis: a randomized study.

Pediatric Allergy and Immunology, 14(2), 140-143. DOI:10.1034/j.1399- 3038.2003.00042.x
7. Wishart DS, Feunang YD, Guo AC, Lo EJ, Marcu A, Grant JR, Sajed T, Johnson D, Li C, Sayeeda Z, Assempour N. DrugBank 5.0: a major update to the DrugBank database for 2018. Nucleic Acids Research. 2018 Jan 4;46(D1):D1074-82.
8. Moitra S, Mahesh PA, Moitra S. Allergic rhinitis in India. Clinical & Experimental Allergy. 2023 Jul;53(7):765-76. For prevalence
9. Strouse PJ, Trout AT, Offiah AC. Editors' notebook: what is 'pediatric'?. Pediatric Radiology. 2022 Nov;52(12):2241-2.
10. Tamasauskiene L, Gasiuniene E, Sitkauskiene B. Translation, adaption and validation of the TNSS score (TNSS) for Lithuanian population. Health Qual Life Outcomes. 2021 Feb 11;19(1):54. doi: 10.1186/s12955-020-01659-8. PMID: 33573646; PMCID: PMC787960
11. Gangaraju SS, Pillai N, Manthal V. A comparative study to evaluate the effects of intranasal steroid spray, isotonic saline nasal irrigation and combination therapy in patients with allergic rhinitis. International Journal of Otorhinolaryngology and Head and Neck Surgery. 2021 Jun;7(6):1004.
12. Luo D, Huang Q, Liu Y. Efficacy of intranasal corticosteroids combined with saline nasal irrigation and Singulair on allergic rhinitis and its influence on serum inflammatory factors. Int J Clin Exp Med. 2019 Jan 1;12(8):10832-8.
13. Shaun Nguyen SA, Psaltis AJ, Schlosser RJ. Isotonic saline nasal irrigation is an effective adjunctive therapy to intranasal corticosteroid spray in allergic rhinitis. American journal of rhinology & allergy. 2014 Jul;28(4):308-11.
14. Madison S, Brown EA, Franklin R, Wickersham EA, McCarthy LH. Nasal saline or intranasal corticosteroids to treat allergic rhinitis in children. The Journal of the Oklahoma State Medical Association. 2016 Apr;109(4-5):152.
15. Wang Y, Jin L, Liu SX, Fan K, Qin ML, Yu SQ. Role of nasal saline irrigation in the treatment of allergic rhinitis in children and adults: A systematic analysis. Allergologia et Immunopathologia. 2020 Jul 1;48(4):360-7.
16. Periasamy N, Pujary K, Bhandarkar AM, Bhandarkar ND, Ramaswamy B. Budesonide vs saline nasal irrigation in allergic rhinitis: a randomised placebo-controlled trial. Otolaryngology–Head and Neck Surgery. 2020 Jun;162(6):979-84.