

# The Impact of Poor Technique of Nasal Spray Uses Among Allergic Rhinitis Patients in Al-Kharj, Saudi Arabia: A Cross-Sectional Study

Mohammad Mokhatrish, MD\* Alwaleed Almouzan, MD\*\* Abdullah Alkhunfur, MD\*\* Abdulelah Alfawaz, MD\*\* Ahmed Alzahrani, MD\*\* Yazeed Alasmari, MD\*\* Saeed Alqahtani, MD\*\* Ali Ababtain, MD\*\* Mohammed Almujaalli, MD\*\* Abdulrahman Aldawsari, MD\*\*\*

## ABSTRACT

Allergic rhinitis (AR) is a common condition with significant implications for quality of life. Intranasal corticosteroids (INCS) are the cornerstone of AR management, but their effectiveness depends on proper administration techniques. The aim of this study was to evaluate the impact of poor INCS technique on treatment efficacy, symptom control, and side effects among AR patients in Al-Kharj, Saudi Arabia. A cross-sectional study was conducted among patients with AR at Prince Sattam bin Abdulaziz University Hospital in Al-Kharj city, using a validated electronic questionnaire assessing demographics, INCS usage, and administration techniques. Pearson's chi-square test was employed to examine the difference between categorical variables. A total of 410 participants were involved in this study, of which 55.6% had AR, with 69.3% reporting INCS use. Improper techniques were common; 49.4% sprayed INCS straight, and only 22.1% directed it away from the nasal septum. Contralateral hand use and correct spray direction were associated with better effectiveness ( $p < 0.05$ ). Side effects such as nasal dryness, bad taste in throat, and epistaxis were frequently reported. Improper INCS techniques significantly affect AR treatment outcomes. Structured educational programs by healthcare providers are essential to improve patient compliance and therapeutic success.

**Keywords:** Allergic rhinitis, intranasal corticosteroids, patient education, Saudi Arabia, technique compliance

## INTRODUCTION

Allergic rhinitis is an inflammation of the nasal mucosa that manifests as nasal discharge, rhinorrhea, sneezing, nasal obstruction, and itching of the nose<sup>1</sup>. It is characterized by an unwanted immune response in individuals with a tendency to generate immunoglobulin E (IgE) after being exposed to environmental allergens such as dust mites, molds, pollen, and animal dander that are often safe and harmless for the general population<sup>1</sup>. Globally, the prevalence of AR ranges from 10% to 30% among adults and more than 40% among children<sup>2</sup>. It is estimated that 14% of adolescents aged between 13 and 14 years in various regions of Saudi Arabia suffer from AR<sup>2</sup>. A study published in 2023 found that the frequency of AR among adults in Saudi Arabia is 37%<sup>3</sup>. Patients with AR experience a variety of difficulties in their day-to-day activities, such as poor sleep, difficulty concentrating in class or at work, and other activities<sup>3</sup>. Intranasal corticosteroids (INCS) are considered the first line of treatment for the management of AR. Intranasal corticosteroids control symptoms and prevent complications by acting locally to inhibit immune cell recruitment and the release of inflammatory mediators from involved cells. Epistaxis, the bad taste of the drug and nasal irritation are typical side effects that might be related to the incorrect technique of administration of drug<sup>4</sup>.

A cross-sectional study was conducted in order to assess the effect of technique of using INCS spray on the side effects and compliance<sup>5</sup>. In this study, a total of 103 patients were involved, and 22 among them (21.4%) reported side effects (including nasal irritation and epistaxis). Out of the 20 patients with epistaxis, 80% used an ipsilateral hand

technique. A total of 30 patients showed poor compliance due to the lack of improvement in symptoms or side effects<sup>5</sup>. Another study in Manipal Teaching Hospital, Pokhara, Nepal, evaluated the nasal spray use technique with the help of a standardized World Health Organization (WHO) nasal spray checklist. The results showed 50.3% improvement after intervention. The intervention comprised individualized education and training on the correct use of nasal spray by a pharmacist<sup>6</sup>.

In Saudi Arabia, a cross-sectional study conducted by Labe Salian et al, in rhinology clinic at King Abdulaziz University Hospital, investigated the correlation between the improper use of INCS and their side effects<sup>7</sup>. The total number of respondents were 150 patients (97.3%) reported the use of the right hand for spraying both nostrils; (2%) of them used the ipsilateral technique for spraying, and none of them used the contralateral technique. For the direction of the nozzle during spraying, (94.7%) of the patients aimed the nozzle improperly, either toward the septum (4.7%) or straight (parasagittal) direction (90%). Regarding side effects, (12.7%) of patients have experienced epistaxis, 31% have experienced dry nose, and (15.3%) have experienced pain<sup>7</sup>.

Allergic rhinitis is one of the most common conditions that affect children and adults<sup>2</sup>. The symptoms and complications of AR can significantly affect people's daily activities and even their quality of sleep, which directly impairs their quality of life<sup>4</sup>. Self-administered INCS need a standard administration technique and long-term compliance to achieve maximum effectiveness. Additionally, the

\* Department of Otolaryngology-Head and Neck Surgery, College of Medicine, Prince Sattam bin Abdulaziz University, Alkharj, Saudi Arabia, mokatresh@hotmail.com

\*\* College of Medicine, Prince Sattam bin Abdulaziz University, Al-Kharj, Saudi Arabia.

\*\*\* ENT Department, King Khalid Hospital, Riyadh First Health Cluster, Alkharj, Saudi Arabia.

optimum INCS technique can overcome many side effects, including epistaxis, dry nose and bad taste<sup>4,8</sup>. In order to achieve maximum benefit from INCS and overcome its side effects, a high level of patient education regarding optimal administration technique of INCS is crucial<sup>4,8</sup>. Patient education of the INCS technique varies from one country to another and depends on many sources, including clear instructions from physician or pharmacists<sup>8,9</sup>. For this reason and due to the gap in knowledge in our region, we aimed to evaluate the impact of poor INCS technique on treatment efficacy, symptom control, and side effects among AR patients in Al-Kharj, Saudi Arabia.

## METHODOLOGY

**Study design and population:** This research employs a quantitative online cross-sectional study design to investigate the impact of poor technique use of INCS among AR patients in Al-Kharj, Saudi Arabia. This study was conducted from June 2024 to December 2024, utilizing an online questionnaire tool that was distributed randomly among AR patients in Prince Sattam bin Abdulaziz University Hospital in Al-Kharj city.

The inclusion criteria encompass adults aged 18 years or older, of both genders, single or married, diagnosed with AR and use INCS as treatment. Exclusion criteria include participants who do not own an electronic device, are illiterate, patients take blood thinner drugs (such as aspirin) or systemic decongestant drugs, or fail to provide complete answers or consent.

**Study instruments:** The questionnaire utilized in the current study was electronic, well-structured, and previously designed and validated<sup>7</sup>. Cultural differences were considered during the development of the questionnaire, which was initially created in English and then accurately translated into Arabic to ensure representation of the broader community. It was formulated to include five sections all with closed-ended questions and split into demographic data, symptoms and severity of AR, INCS duration of use and side effects, INCS administration technique, and level of satisfaction and compliance. First section included questions about gender, age, education level, marital status, and occupational status. Second section included questions regarding onset, symptom, and severity of AR. Third section utilized questions about the duration of use INCS side effects. including epistaxis, dry nose, bad taste of drug, pain, and itching. The fourth section included questions about technique regarding source of information, cleaning nose before administration, which hand the patient used, direction of spray, head positioning, and closing the nose after administration. The last section included questions regarding level of satisfaction and improvement.

**Study variables definition:** History of chronic illness referring to the overall wellness of the participant, this variable indicates whether individuals have chronic diseases, necessitating active management plans. Chronic diseases have significant outcomes in the long term and persistently affect health. History of allergic illness referring to previous history of atopic dermatitis (eczema), asthma, and food allergies, this variable is associated with allergic rhinitis. It signifies the interconnectedness of various allergic conditions and their potential impact on intranasal steroid spray usage. Knowledge of utilization referring to participants' attitudes toward the correct usage of intranasal spray, including understanding the correct dosage, side effects, administration methods, and compliance. This variable assesses participants' awareness and understanding of correct usage practices.

**Data collection:** This study employed a quantitative cross-sectional method utilizing an electronic well-structured, previously designed

and validated. The questionnaire was randomly distributed among AR patients at Prince Sattam bin Abdulaziz University Hospital in Al-Kharj city utilizing convenience sampling technique. Participants aged 18 and older, of all genders, were included.

**Sample size:** The sample size in this study was estimated according to this formula with significance adopted at  $p > 0.05$  [ $n = NZ^2P(1 - P)/(D^2 + NZ^2P(1 - P))$ ], and the total respondents should be about \*150\* The targeted number of participants has been increased to enhance the statistical power of the study estimates.

**Data analysis:** The extracted data was evaluated, coded, and analyzed using Stata Statistical Software: Release 17 (Stata Corp LLC, College Station, TX, USA). Descriptive statistics, including frequencies and percentages, were used to summarize categorical variables. Pearson's chi-square test was employed to examine the difference between categorical variables. A  $p$ -value  $< 0.05$  was considered statistically significant.

**Ethical considerations:** The study was reviewed by the research committee of Prince Sattam bin Abdulaziz University and received the approval from the institutional review board (IRB) (Approval number SCBR-311/2024). The study anonymous questionnaire protected participants' confidentiality and privacy. Before participating in the study, participants have been given a thorough explanation of the study's purpose and benefits, and their informed consent have been obtained.

## RESULTS

The study included 410 participants, (57.8%) were males and (42.2%) were female. The majority were aged 18–30 years (60.2%). Most participants had a bachelor's degree (69.5%) and (58%) were unmarried (Table 1).

**Table 1.** Demographic Characteristics of Study Participants (N=410)

Characteristic	Frequency	Percentage
Gender		
Male	237	57.8
Female	173	42.2
Age		
18 - 30	247	60.2
31 - 40	48	11.7
41 - 50	59	14.4
51 - 60	41	10.0
>60	15	3.7
Educational Level		
High school or lower	101	24.6
Bachelor's degree	285	69.5
Masters or PhD	24	5.9
Marital Status		
Unmarried	238	58.0
Married	161	39.3
Divorced or widowed	11	2.7

Around 55.6% of the patients reported having AR and most common symptoms include sneezing (36.8%), nasal obstruction (35.4%), headache (32.7%), and runny nose (32%) (Table 2).

**Table 2.** Frequency of Allergic Rhinitis Symptoms (N=410)

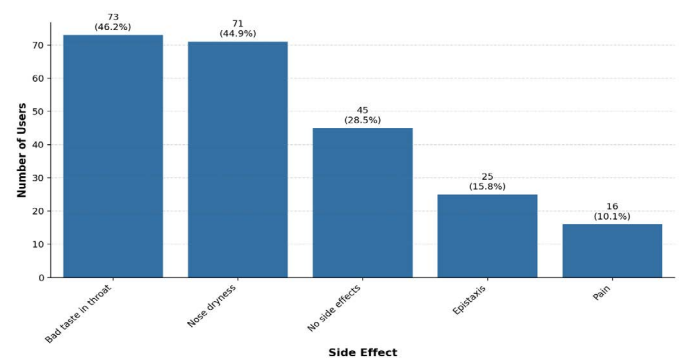
Symptom	Frequency	Percentage
Sneezing	151	36.8
Nasal obstruction due to congestion	145	35.4
Headache	134	32.7
Runny nose	131	32.0
Itching in the eye, nose, mouth, or skin	101	24.6
Cough	78	19.0
Redness and Swelling in the eye	55	13.4

Among those with AR, 50.4% experienced moderate-to-severe symptoms affecting sleep or daily activities. The use of INCS was reported by 69.3% of AR patients. However, improper administration techniques were prevalent. For instance, 49.4% of users sprayed INCS straight, and only 22.1% directed it away from the nasal septum. Regarding hand preference, 69.6% used the right hand for both nostrils, while 20.9% used contralateral techniques. Head positioning was another area of concern, with 50% of participants raising their heads during administration and 32.9% their heads in natural during application. Notably, 47.5% of INCS users stopped treatment due to ineffectiveness or side effects (Table 3). The most common side effects reported were bad taste in throat (46.2%) and nasal dryness (44.9%) (Figure 1).

**Table 3.** Allergic rhinitis and INCS utilization pattern.

Characteristic	Frequency (percentage)
Allergic rhinitis	
<b>Yes</b>	228 (55.6)
<b>No</b>	182 (44.4)
Severity of symptoms	N= 228
<b>Mild (symptoms don't affect sleep or daily activity)</b>	113 (49.6)
<b>Moderate to severe (symptoms affect sleep or daily activity)</b>	115 (50.4)
Frequency of symptoms	N= 228
<b>&lt; 4 days per week</b>	152 (66.7)
<b>&gt; 4 days per week</b>	76 (33.3)
Use of intranasal corticosteroids	N= 228
<b>Yes</b>	158 (69.3)
<b>No</b>	70 (30.7)
Since when you used INCS	N= 158
<b>One month or less</b>	58 (36.7)
<b>Three months</b>	26 (16.5)
<b>Six months</b>	8 (5.1)
<b>One year</b>	7 (4.4)
<b>More than one year</b>	59 (37.3)
Which hand do you prefer for Intranasal corticosteroids	N= 158
<b>Right hand for both nostril</b>	110 (69.6)
<b>Right hand for right nostril and left hand for left nostril</b>	33 (20.9)
<b>Left hand for both nostril</b>	15 (9.5)
When you use the spray which direction do you prefer	N= 158
<b>Straight</b>	78 (49.4)
<b>Towards nasal septum</b>	45 (28.5)
<b>Away from nasal septum</b>	35 (22.1)

What is the head position when you use nasal spray	N= 158
<b>Head is raised</b>	79 (50.0)
<b>Natural position</b>	52 (32.9)
<b>Head is lowered</b>	27 (17.1)
How do you evaluate the effectiveness of the drug	N= 158
<b>Moderately effective</b>	79 (50.0)
<b>Very effective</b>	66 (41.8)
<b>Not effective</b>	13 (8.2)
Have you ever stopped taking the medication because it was ineffective or due to its side effects	N= 158
<b>Yes</b>	75 (47.5)
<b>No</b>	83 (52.5)

**Figure 1.** Reported side effects of INCS.

Regarding the source of information, the doctor was the main source (55.1%), followed by YouTube or internet (19.6%) (Table 4).

**Table 4.** Sources of Information for Using Nasal Spray

Information Source	Frequency (percentage)
<b>From the doctor</b>	87 (55.1%)
<b>From YouTube or internet</b>	31 (19.6%)
<b>Did receive any information about the way of using spray</b>	30 (19%)
<b>From the pharmacist</b>	28 (17.7%)

Effectiveness varied by technique. Contralateral hand use was related with higher effectiveness (60.6%) rated as “very effective” compared to ipsilateral techniques, Table 5.

Spray direction away from the nasal septum yielded the highest “very effective” rating (51.4%). Regarding head position, lowering the head was highest “very effective” rating (59.3%), Table 6.

## DISCUSSION

This study emphasizes the critical role of proper INCS administration in optimizing AR management. Incorrect techniques, as observed in a majority of participants, contribute significantly to suboptimal therapeutic outcomes, increased side effects, and poor compliance. Our findings align with previous research, illustrating how improper INCS technique affects efficacy and compliance. For instance, Banigo et al. (2017) found that patients using ipsilateral hand techniques were more likely to experience side effects such as epistaxis and reduced adherence<sup>5</sup>. Similarly, Nasir et al. (2020) demonstrated the importance of patient education in improving technique and symptom control, reporting a marked improvement in compliance among patients trained in correct application methods<sup>8</sup>. Treat et al. (2020) further emphasized

**Table 5.** Effectiveness of Intranasal Corticosteroids by Hand Preference

Which hand you prefer for Intranasal corticosteroids	Very Effective (n, %)	Moderately Effective (n, %)	Not Effective (n, %)	Total (n, %)	p-value
Right hand for right nostril and left hand for left nostril	<b>20 (60.6%)</b>	<b>11 (33.3%)</b>	<b>2 (6.1%)</b>	<b>33 (100.0%)</b>	<b>0.641</b>
Left hand for both nostrils	<b>6 (40.0%)</b>	<b>7 (46.7%)</b>	<b>2 (13.3%)</b>	<b>15 (100.0%)</b>	
Right hand for both nostrils	<b>53 (48.2%)</b>	<b>48 (43.6%)</b>	<b>9 (8.2%)</b>	<b>110 (100.0%)</b>	
Total	<b>79 (50.0%)</b>	<b>66 (41.8%)</b>	<b>13 (8.2%)</b>	<b>158 (100.0%)</b>	

**Table 6.** Effectiveness of Intranasal Corticosteroids by Spray Direction Preference

Spray Direction Preference	Very Effective (n, %)	Moderately Effective (n, %)	Not Effective (n, %)	Total (n, %)	p-value
Away from nasal septum	<b>18 (51.4%)</b>	<b>13 (37.1%)</b>	<b>4 (11.4%)</b>	<b>35 (100.0%)</b>	<b>0.119</b>
Towards nasal septum	<b>21 (46.7%)</b>	<b>24 (53.3%)</b>	<b>0 (0.0%)</b>	<b>45 (100.0%)</b>	
Straight	<b>40 (51.3%)</b>	<b>29 (37.2%)</b>	<b>9 (11.5%)</b>	<b>78 (100.0%)</b>	
Total	<b>79 (50.0%)</b>	<b>66 (41.8%)</b>	<b>13 (8.2%)</b>	<b>158 (100.0%)</b>	

Notably, (47.5%) of INCS users stopped treatment due to ineffectiveness or side effects. The most common side effects reported were nasal dryness and epistaxis, Table 7.

**Table 7.** Effectiveness of Intranasal Corticosteroids by Head Position During Use

Head Position During Use	Very Effective (n, %)	Moderately Effective (n, %)	Not Effective (n, %)	Total (n, %)	p-value
Head is lowered	<b>16 (59.3%)</b>	<b>9 (33.3%)</b>	<b>2 (7.4%)</b>	<b>27 (100.0%)</b>	<b>0.683</b>
Head is raised	<b>35 (44.3%)</b>	<b>37 (46.8%)</b>	<b>7 (8.9%)</b>	<b>79 (100.0%)</b>	
Natural position	<b>28 (53.9%)</b>	<b>20 (38.5%)</b>	<b>4 (7.7%)</b>	<b>52 (100.0%)</b>	
Total	<b>79 (50.0%)</b>	<b>66 (41.8%)</b>	<b>13 (8.2%)</b>	<b>158 (100.0%)</b>	

the biomechanical advantages of directing the nozzle laterally away from the nasal septum to enhance drug deposition and minimize septal trauma, consistent with our findings that lateral spray direction was associated with higher effectiveness<sup>10</sup>.

The source of information about INCS use was a key factor influencing patient outcomes. In our study, 55.1% of participants identified doctors as their primary source of information, followed by 19.6% relying on YouTube or internet resources. This highlights a positive trend toward patients receiving professional guidance, though the reliance on unverified sources remains significant. Treat et al. (2020) emphasized that patient outcomes improve with structured, tailored education from healthcare professionals, underscoring the importance of physician-led interventions<sup>10</sup>.

Hand preference also impacted outcomes, with contralateral hand use associated with greater effectiveness (60.6% rated as “very effective”). This is consistent with Treat et al. (2020), who demonstrated that contralateral techniques optimize drug delivery to the target regions while avoiding nasal septum trauma. Similarly, patients who directed the spray away from the septum reported higher efficacy compared to those spraying straight or toward the septum<sup>10</sup>.

Head positioning during application was another area of concern. While only 17.1% of patients lowered their heads during administration, this position was associated with slightly better effectiveness compared to neutral or raised head positions. Treat et al. (2020) noted that tilting the head downward facilitates drug distribution to the superior nasal cavity, where inflammation often occurs, supporting our findings<sup>10</sup>.

The high rate of discontinuation (47.5%) due to perceived ineffectiveness or side effects further underscores the need for education. Patients commonly reported side effects such as nasal dryness, epistaxis, and discomfort, which are largely preventable with proper administration techniques. Structured education programs have shown significant promise in addressing these issues. For example, Binita KC et al.

(2019) reported a 50.27% improvement in technique after pharmacist-led training using pictorial aids<sup>6</sup>.

Additionally, El-Gamal et al. in their study of AR in Jeddah Saudi Arabia, emphasized the importance of physician-patient communication in improving treatment adherence and symptom control<sup>3</sup>. Our findings build on this by demonstrating that physicians remain the primary source of information (55.1%) for patients, which provides an opportunity to enhance educational interventions through more structured and consistent counseling.

Overall, this study highlights the importance of a multidisciplinary approach to improving INCS use<sup>11</sup>. While physicians currently serve as the primary source of information, further collaboration with pharmacists and allied healthcare providers could enhance educational reach and consistency. Future research should explore long-term benefits of these interventions, particularly their impact on patient satisfaction, symptom relief, and healthcare costs.

Intranasal corticosteroids are recognized as a safe and effective initial treatment for AR. Fluticasone propionate, mometasone furoate, flunisolide, beclomethasone dipropionate, and triamcinolone acetonide are among the numerous INCS that are available in the market<sup>12</sup>. All are effective therapeutic options in the treatment of seasonal AR and as a prophylaxis for perennial AR. In general, they alleviate nasal congestion, sneezing, and irritation, rhinorrhoea that occur during the early and late phases of an allergic response<sup>13-15</sup>. Studies have demonstrated that they almost entirely prevent late-phase symptoms<sup>12</sup>. The rationale for the use of topical INCS in the treatment of AR is the ability to obtain sufficient drug concentrations at receptor sites in the nasal mucosa.

## Study Limitations

The study may have some limitations which include the use of an electronic self-reported questionnaire which may depend on patient

knowledge of electronic devices and prone to reporting bias. The impact of poor INCS technique on patients have been observed only without instructing patients about optimal technique and analyzing their improvement. Furthermore, limited geographic scope as this study may have a limited geographic reach; as a result, the findings may not be generalizable to other regions or countries.

## CONCLUSION

**This study demonstrates that improper INCS use is prevalent among AR patients in Saudi Arabia, leading to reduced effectiveness and increased side effects. Contralateral hand techniques and directing the spray away from the nasal septum were associated with better outcomes. These findings underscore the urgent need for structured educational interventions by healthcare providers to enhance patient compliance and optimize therapeutic benefits.**

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**Competing Interest:** None

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