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INSIGHTS ON ALLERGIC RHINITIS MANAGEMENT AND IMPACT OF PHARMACIST-LED EDUCATIONAL INTERVENTION ON PATIENTS' KNOWLEDGE: A CROSS-SECTIONAL STUDY

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Abstract

Background: Allergic rhinitis (AR) is a common disorder that is strongly linked to asthma and conjunctivitis. Intranasal therapy (INT) remains the backbone of allergic rhinitis management.

Aims: The present study aimed to assess the impact of pharmacist-led educational intervention on the management of AR.

Methodology: This prospective interventional study includes rhinitis patients from Quaid-i- Azam International Hospital and community pharmacists from pharmacy setups in Islamabad, Pakistan. Pre- and post-intervention competency was assessed and evaluated statistically. AR management of patients was evaluated through skin prick test and AR Control Questionnaire (ARC) scores.

Results: Registered pharmacists from 100 pharmacies were included in this study including 71% male and 29% female pharmacists (p value < 0.0001). All pharmacists were interviewed to assess their knowledge about AR, patients' symptoms, and the management of Nasal Corticosteroid (NCS) usage in patients (7 days, 14 days or 1 month). Pharmacists were also categorized as competent and non-competent in NCS demonstration based upon the ability of pharmacists to demonstrate all the essential steps correctly with a total score of ≥ 5.

Conclusion: The data showed that before intervention only 24 pharmacists scored seven, demonstrating all the essential steps and were considered and classified as non-competent (p- value 0.05). McNamar tests analysis showed that pharmacists' competence level was significantly improved from 29% before educational intervention to 48% after intervention (p- value 0.0057).

Keywords: Allergic Rhinitis (AR), Pharmacist, Intranasal Therapy (INT), Nasal Corticosteroids (NCS), McNamar

Impact Statement: Continued Education is necessary for all healthcare professionals along with practical exposure.

Introduction

Allergic rhinitis (AR) is an inflammation of the nasal mucosa. It is a prevalent condition affecting up to 14% of the population [1]. AR is the most prevalent form of chronic rhinitis, affecting 10 to 20% of the population, and there is evidence that the frequency of this condition is rising [2]. Acute AR has been linked to substantial deficits in living quality, sleep, and job performance [2-3,5]. Evidence suggests that irritation of the upper respiratory tract not only reacts to the inflammation of its neighboring organ structures but may also activate inflammatory processes in the lower airways. This may be confirmed by the fact that rhinitis and asthma episodes sometimes occur together. Consequently, rhinitis and asthma appear to reflect a mixture of airway inflammation; this should be taken into account to provide appropriate diagnosis and treatment of individuals with AR [4-7].

Common symptoms of AR include sneezing, runny nose, nasal congestion, itchiness in the nose, sore throat, irritation in the eyes, watery eyes, headaches, hives, and dry skin [2-3]. Upon interaction with an allergen, individuals will often experience one or more of the following symptoms. Some symptoms, such as persistent headaches and exhaustion, may only occur after prolonged exposure to allergens. Hay fever does not cause fever [2,6,8]. In patients with SPT and current rhinitis according to ARIA status, the prevalence of current rhinitis was estimated to be 39.4%, whereas 24.4% were identified as NANR controls. In Pakistan, 19.2% of the population experienced AR, with sneezing being the most frequent symptom, followed by itchy, watery eyes and a runny or plugged nose. The majority of individuals reported experiencing these symptoms during the winter and having an allergy to dust (75%), tobacco (50%), and fragrances (8%) [3,5,6].

Conventionally, AR is categorized as seasonal (recurring over time) or chronic (occurs year-round). Currently, rhino sinusitis is classified by symptoms duration (temporary or chronic) and severity (mild, moderate, or severe) [6-7]. Impact on Respiratory Disorders (ARIA) has characterized "moderate" rhinitis as a symptom of fewer than four days a week or less than four consecutive weeks, and "persistent" rhinitis as symptoms four days each week and over four consecutive weeks [2-3]. Symptoms are categorized as moderate/severe when they have a considerable influence on sleep or daily activities and/or when they are regarded to be bothersome [4-6]. The immunological response of the body to allergens consists of early- and late-phase responses. Included in these responses is the allergic cascade. This cascade incorporates more than simply histamine as an allergic mediator. Typically, allergy cascades adhere to this pattern. 1) Allergen sensitivity 2) Early reactions to allergen re-exposure and 3) Late responses. AR can be diagnosed by skin prick test or by blood testing. In the skin prick test, the skin of the back of the arm is pricked and exposed to an

allergen if any allergy is present it will become a red bomb while during blood testing, the allergen is injected into the skin and then waited for 15-20 minutes for the response of any allergy [9-10].
The proper management of AR is largely dependent on drug adherence while intranasal corticosteroid therapy (INCS) is considered the most essential treatment, the application of which is contingent upon proper INCS spray technique. Improving patients' understanding of INCS spray would result in greater adherence and, subsequently, improved treatment outcomes for AR. In the treatment of AR, INCS therapy is extremely crucial. Even though incredibly effective intranasal therapy (INT) treatments are available now, AR remains uncontrolled on a global scale. The most prevalent reasons for poor control of AR include lack of patient education, higher drug costs, limited access to health care, and lack of application of guidelines for treatment and management of AR [9-10,12]. Although each therapy approach will lessen a patient's AR symptoms, physicians need to personalize the treatment choice with the patient's specific needs. Each of the above situations would need distinct considerations: 1) Individual with nasal congestion as the major complaint, 2) Individual with intermittent or episodic nasal AR symptoms, 3) Individual with mild AR symptoms, 4) Individual with moderate to severe AR symptoms.

Over-the-counter (OTC) medication has increased the role of pharmacists in the early diagnosis of AR without mixing its symptoms with common flu. Pharmacists can play a crucial role in the management of AR as it should be managed according to the patient's specific symptoms and their severity by adjusting the dose of patients and keeping a keen look at the daily routine of patients. Thus, by educating the patients about AR and the proper administration techniques of INCS, the pharmacist can counsel the patients accordingly. Pharmacist-led educational intervention programs can play a vital role in this regard. Awareness tools increase the patient's knowledge and basic counselling about the disease. Rhinitis treatment with INCS spray is highly dependent on the patient's proper way of administration. However, both patients and healthcare professionals have insufficient awareness of the optimal approach for using INCS spray. Several studies demonstrate that improper INCS spray method in patients is the consequence of poor INCS spray technique teaching by medical professionals. Pharmacy practitioners are at the forefront of dispensing and instructing patients on medication-related methods. It is therefore the pharmacist's responsibility to educate patients on the optimal usage of their drugs [13]. The role of the pharmacist in managing minor diagnostic difficulties such as confirming the existence of AR, choosing a course of therapy, encouraging patient self- management and long-term monitoring is quite crucial. Are pharmacists playing a critical role in instructing patients on how to properly utilize INCS spray? In light of this crucial question, the justification for the conduction of this study was that in particular via pharmacist-led educational initiatives, the problem of managing the proper use of INCS spray may be resolved by enhancing the involvement of pharmacists in patient education.

Aims

The basic aim of the study was to evaluate the community pharmacists' knowledge of
AR management issues, such as confirming the presence of AR, choosing a course of treatment plan, patient self-management, and the impact of pharmacist-led educational interventions on healthcare professionals and patients having AR.

Ethical Approval

Ethical approval from the Institutional Ethical Review Board and Bio-Ethical Committee (BEC) of Quaid-i-Azam University, Islamabad was attained with protocol approval number BEC-FBS-QAU2022-394 attributed to the present study. After the evaluation of this project, unconditional permission was granted from Quaid-e-Azam International Hospital Pakistan to proceed with this project with the protocol reference number being assigned.

Methodology

The methodological design of the study was a prospective observational research which was conducted to evaluate the knowledge of pharmacists regarding the management of rhinitis patients along with the effect of educational intervention provided to them regarding the correct technique for the use of "Intranasal Corticosteroid Spray (INCS)". A bi-phasic study was conducted, involving two sections, a prospective observational study on pharmacists and a prospective observational study on rhinitis patients. The approved evaluation instruments were used to measure the effect of the pharmacist-led intervention: the proper use of INCS before and after intervention in both, pharmacists and patients, a skin prick test, a visual analog scale (VAS), and a questionnaire on managing AR. On a 7-point Likert scale, the Management requests responses to 21 questions in five categories (activity restriction, practical issues, nasal symptoms, eye symptoms). The VAS is a 10-point scale that is used to assess perceived symptom severity, where 10 represents the worst possible state of symptoms and 0 represents no symptoms. The approach was applied to patients and pharmacists, scoring 11 on the INCS, and data from pre- and post-intervention were collected.

This tool contains a total of 10 questions based on portability, ease of use, affordability, difficulties in usage and handling, as well as overall satisfaction. Each question response was recorded in a 5-item Likert scale as "very, fairly, somewhat, not very, hardly at all" scored from 5-1 respectively. Hence, presenting a minimum score of 0 = totally unsatisfied to 50 = highly satisfied. The FSI-10 questionnaire was translated into Urdu as well. Patients individually filled out this questionnaire on their own; pre- and post-intervention and level of satisfaction were assessed based upon criteria set by [16] as Low satisfaction Scores < 43 High satisfaction Scores ≥ 4 150 pharmacies out of 250 legally registered pharmacies and drug stores were contacted using a simple and convenient sampling technique while in the second phase AR patients from the outpatient department (OPD) of the Eye, Nose and Throat (ENT) department at Quaid-e- Azam International Hospital. The data was collected by analyzing the "Statistical Package for Social Services" software program (SPSS Inc., version 21.0, IBM Corp., Armonk, NY, USA). The outcome variables were summarized using descriptive and inferential statistics. The categorical variables were shown in percentages and frequencies, while quantitative variables were shown as mean and standard deviations. To determine association between independent variables, chi-square tests (Pearson chi-square) were used, where chi-square analysis assumptions were not satisfied, Fisher exact tests were used to calculate p-values. To further access categorical variables, the McNamara test was applied to intragroup (paired data) comparisons before and after intervention (pre- and post-intervention) to assess categorical variables. P-values less than 0.05 were deemed statistically significant.

Results:

In this study, 100 community pharmacists were included to evaluate their knowledge about the use of NCS. The demographic data of pharmacy setups and pharmacists was also taken. Of all the pharmacies, 36% were located in rural areas and 64% were located in the urban area and this proportion was significantly higher (p-value 0.0001). Considering the pharmacy types, 31% of pharmacies were chain while 69% were individual pharmacies and their proportion was significantly higher than chain pharmacies (p-value 0.0001). In addition, there were 9% of pharmacies that were set up recently i.e., in < 1 year, 29% were 1-3 years old, 35% were 3-6 years old, 14% were 6- 9 years old and only 11% were set up > 10 years ago. So, the median duration for the pharmacy setup was 3-6 years during which a significantly higher proportion of pharmacies were established).

From 100 pharmacies, registered pharmacists were included in this study including 71% male and 29% female pharmacists. The ratio of male to female pharmacists was 3:1 which shows that the proportion of male pharmacists was significantly high (p-value < 0.0001) as compared to female pharmacists. The marital status of pharmacists showed that 41% of them were married and 59% were unmarried. The proportion of unmarried pharmacists was significantly greater (p-value

0.01017) than married pharmacists. All pharmacists were stratified into two age groups: 25-30 years and 30-50 years of age. Our data showed a significantly higher proportion (72%) of young pharmacists between the ages of 25-30 as compared to the other group of pharmacists (28%) with a p-value of < 0.0001. The educational background of the pharmacists showed that 67% of pharmacists had a professional degree in pharmacy (Pharm.D.) and 33% of them had a higher degree (M.Phil.) with a p-value of < 0.0001. Overall, 71% of the pharmacists had professional experience < 5 years, and 29% had experience of > 5 years of age which is significantly different (p-value < 0.0001). Interestingly, a significant proportion of pharmacists (80%) had no training on using NCS (p-value < 0.0001) as compared to trained pharmacists.

All pharmacists were interviewed to assess their knowledge about AR, patients' symptoms, and the management of NCS usage in patients. Pharmacists were asked about the clinical symptoms of patients (such as sneezing, itchy nose, nasal congestion, runny nose, and itchy eyes), duration of symptoms (one day, three days, and seven days), presence of symptoms (occasional or all the time), information regarding allergic source (outdoor, pollen season, animals, and indoor), diagnosis of patients by the physician (hay fever, allergic rhinitis, and asthma), nasal discharge of patients (clear, watery), presence of shortness of breath or wheezing, the experience of earache or facial pain, history of allergic rhinitis, eye burns, dry eyes, photophobia, prescribed treatment of AR (Budesonide, Fluticasone, Mometasone furoate, Fluticasone with azelastine or others), and recommendation of treatment with local corticosteroid in AR patients (7 days, 14 days or 1 month). In addition, information related to frequency of use of NCS, prescribing instructions for NCS, usage instructions for NCS, side effects of NCS, contradictory factors of NCS, maximum daily usage of NCS, history of asthma and usage of inhalers was also collected from all pharmacists (Figure 3.3).

Before and after the educational intervention, knowledge about NCS technique was evaluated using a simulated patient approach. Among these four steps were essential (steps 3, 4, 5, and 8). When the techniques of using NCS by pharmacists was evaluated for the essential steps, all the steps; shaking of the bottle before use (52%), removal of the cap (66%), clearing of the nose (67%), using the opposite hand to the nostril being treated, placing the end of the spray bottle just inside the nostril aiming away from the septum pointing to the ear or eye (73%), and activation of the spray (66%) were incorrectly performed by a significantly higher proportion of pharmacists (p-value < 0.0001). Following the pre-intervention assessment, pharmacists were instructed about the correct usage technique of NCS. NCS technique post- intervention was evaluated after 1 month of intervention provision and the results are shown in Table 3.8. Post-intervention evaluation illustrated that majority of pharmacists i.e., 96% demonstrated the correct use of NCS for all the essential steps (p-value 0.0001). Step 3 i.e, shaking the bottle before use was correctly performed by 90% (p-value < 0.0001), step 4 removal of the cap was correctly performed by 88% (p-value 0.0001), step 5 clearing of the nose was correctly performed by 78% (p-value < 0.0001), step 8 using the opposite hand to the nostril being treated, placing the end of the spray bottle just inside the nostril aiming away from the septum pointing to the ear or eye was correctly performed by 94% (p-value < 0.0001) and step 9 activation of the spray was correctly performed by 96% (p- value < 0.0001) of the pharmacists. The educational intervention significantly improved the NCS technique of pharmacists.

Chi-square test was applied to evaluate the difference in inhaler technique statistically at each step. Statistically significant (p-value 0.0057) was observed for each step. There is a significant difference in the proportion of pharmacists who correctly demonstrated all the steps; step 3 (48% before intervention vs. 88% after intervention, p-value 0.0001), step 4 (34% before intervention vs. 84% after intervention, p-value < 0.0001), step 5 (33% before intervention vs. 66% after intervention, p-value < 0.001), step 4 (7% before intervention vs. 53% after intervention, P < 0.001), step 8 (27% before intervention vs. 89% after intervention, P < 0.001), and step 9 (34% before intervention vs. 81% after intervention, p-value < 0.0001).

Pharmacists were also categorized as competent and non-competent in NCS demonstration. Competency was based upon the ability of pharmacists to demonstrate all the essential steps correctly with a total score of ≥ 5. The data showed that before intervention only 24 pharmacists scored 7 demonstrating all the essential steps and were considered competent while the majority of participants failed to perform all the essential steps and scored < 5 and were classified as non-competent in knowledge regarding NCS technique. McNamara tests analysis showed that pharmacists' competence level was significantly improved from 29% before educational intervention to 48% after intervention (p-value 0.0057).

Chi-square test and Fischer exact tests analysis showed that adequacy of inhalation technique was significantly differed from education level (p-value 0.044). Male pharmacists were more competent than female (p-value 0.020). The pharmacists having an M.Phil. degree showed higher competency as compared to Pharm.D. graduated pharmacists (p-value < 0.0001). The pharmacists who had taken any training on NCS technique were significantly more competent (p-value < 0.0001) than pharmacists who had not received any relevant training on NCS techniques. In addition, type of pharmacy was also found as a significant factor that affected competency in NCS use technique (p-value 0.005). Pharmacists practicing at chain pharmacy setups demonstrated better competency as compared to pharmacists practicing at individual pharmacy setups. Other variables such as gender, marital status, experience and location of pharmacy were found as statistically insignificant (p-value > 0.05) factors that had no association with NCS use technique in current analysis.

Patients were questioned about the impact of AR on various life activities. AR significantly impacted their sleep (p-value < 0.0001) and work life (p-value < 0.0001) as compared to social and physical activities which were significantly unaffected by AR (p-value< 0.0001). On the basis of severity score, a higher proportion of patients had moderate effect of AR on them (p-value < 0.0001). Statistical analysis indicated a substantial improvement in the satisfaction of patients as the consequence of educational intervention ($p < 0.05$) which implies that training patients regarding metered NCS usage resulted in boosting the level of satisfaction of patients with their NCS technique. In order to analyze the statistical analysis of the sensation of satisfaction as the outcome of educational intervention and To establish statistically the relationship between NCS method and satisfaction with NCS usage, a Pearson chi-square analysis was employed. There was a statistically significant correlation between the improvement of NCS technique and the rise in patient satisfaction among NCS users. A p-value of < 0.05 indicated a statistically significant relationship between these two variables.

Discussion:

The Pharmacist's role in the management of allergic rhinitis and correct use of INCS cannot be denied, as primary healthcare professionals they are playing a vital role in these two outcomes. In the following study, we have noticed that intervention in both pharmacists and patients has changed the whole scenario of the results, outcomes are out of class and pharmacist-led Educational intervention rather than concern with pharmacists or patients has played a classical effect on the entire study, the significance level is under the range and results are to be considered valid and effective [14-15].

The study proposes a local standard of treatment directed by pharmacists that combines patient education and the pharmaceutical care algorithm in allergic rhinitis management in recognition of the significance of pharmaceutical care and the potential expansion of pharmacists' duties. This strategy was developed largely for public services like hospitals and clinics for primary care. To improve patient understanding of the disease and management of allergic rhinitis, we propose the Pharmacist-led Education model (AR-PRISE). The management of allergic rhinitis by patients is covered by this paradigm, including assistance from pharmacists and other medical professionals. The goal of this planned therapy is to give patients greater self-assurance in their ability to control their long-term illness and manage their symptoms as desired. The patient's treatment expectations,

understanding and avoiding allergens, and nasal product administration methods are all highlighted in the patient education component. Patients will get detailed textual and/or video patient education to help them do this. The pharmacist will then help the patient in accordance with the pharmaceutical care algorithm. This strategy will support pharmacists in monitoring disease severity, patient comprehension, and drug adherence while providing patients with structured counseling. Intranasal corticosteroids' effectiveness will also be assured; it will be added. Additionally, the pharmacist will keep an eye on symptom control, quality of life, and flare-ups of allergic rhinitis. The patient must be taught by the pharmacist how to identify allergic rhinitis and/or asthma exacerbation symptoms (if allergic rhinitis co- exists with asthma).

When community pharmacists act in their twin roles as advisors and medical liaisons in response to patients' requests for assistance, they are playing a major role in helping people to make informed about self-assessment choices. This is true from a larger perspective on self- management. The importance of pharmacists in the medical home/integrated healthcare system is being recognized more and more. They play a key role in resolving medication-related concerns, optimizing complicated regimens, implementing adherence programs, and providing medications that are cost-effective. Pharmacists' role as a crucial provider of direct patient care is growing as clinical data show that they are increasingly relied upon to prolong, strengthen, and explain medication use and sickness treatment programs. By noticing, consumers commonly discuss medication-related difficulties with pharmacists before speaking with another healthcare provider. Studies show that pharmacists may improve patient outcomes by enhancing adherence to recommended medication regimens, which is a key factor in the treatment of chronic diseases.

The most important aspect of self-management of AR, or any chronic condition, is medication expectations. None of the existing drugs used to treat AR are capable of curing the illness. Certain drugs and drug combinations can help reduce allergy symptoms, but none can cure the illness. Healthcare professionals must assist allergy patients in selecting the most effective medication to ease their symptoms, taking into account the patient's requirements and preferences. With the recent approval of mometasone furoate and fluticasone nasal sprays as over-the-counter (OTC) medications in the United States, the pharmacist's role in assisting patients with self-management of their diseases, particularly allergy symptoms, has grown in importance. In addition to product selection, patient knowledge about their chronic condition and appropriate usage of the chosen drug can increase treatment satisfaction and patient outcomes with improved AR control. Allergic rhinitis is a common disorder that is strongly linked to asthma and conjunctivitis. Management of Allergic Rhinitis on the edge of a pharmacist can be helpful for patients in the early stage. Intranasal therapy is the backbone for allergic rhinitis management due to localized delivery and rapid onset of action. Currently, intranasal corticosteroid sprays are the most widely prescribed and dispensed nasal sprays worldwide due to the advantage of better efficacy. The present study aimed to assess the impact of educational intervention on the management of allergic rhinitis by community pharmacy professionals as well as rhinitis patients; regarding intranasal corticosteroid spray technique. This prospective interventional study recruited rhinitis patients from Quaid-i-Azam International Hospital and community pharmacists from pharmacy setups in Islamabad, Pakistan. Management of allergic rhinitis by a pharmacist and intranasal technique steps based upon "National Allergic Rhinitis Education and Preventive Program" criteria was set as an evaluation tool to evaluate the competency of pharmacists and rhinitis patients regarding INCS appropriate technique. The intervention involved educating study subjects (pharmacists and rhinitis patients) practically through placebo nasal spray and theoretically through intranasal spray technique-directed literature brochures. Pre- and post-intervention competency was accessed and evaluated statistically. Allergic rhinitis management of patients was evaluated through skin prick test and Management of AR Control Questionnaire (ARC) scores that were associated with the intranasal technique, level of satisfaction, and extent of adherence with intranasal spray. The association of

these variables with intranasal technique was evaluated statistically, before and after the provision of educational intervention. From 100 pharmacies, registered pharmacists were included in this study including 71% male and 29% female pharmacists (p-value < 0.0001).

The educational background of the pharmacists showed that 67% of pharmacists had a professional degree in pharmacy (Pharm D) and 33% of them had a higher degree (M.Phil.) with a p-value of < 0.0001. Overall, 71% of the pharmacists had professional experience < 5 years, and 29% had experience of > 5 years of age which is significantly different (p-value <0.0001). Interestingly, a significant proportion of pharmacists (80%) had no training on using INCS. All pharmacists were interviewed to assess their knowledge about AR, patients' symptoms, and the management of NCS usage in patients (7 days, 14 days or 1 month). Pharmacists were also categorized as competent and non-competent in NCS demonstration based upon the ability of pharmacists to demonstrate all the essential steps correctly with a total score of ≥ 5. The data showed that before intervention only 24 pharmacists scored seven demonstrating all the essential steps and were considered competent while the majority of participants failed to perform all the essential steps (scored <5) and were classified as non- competent (p-value < 0.05). McNamara tests analysis showed that pharmacists' competence level was significantly improved from 29% before educational intervention to 48% after intervention (p-value 0.0057). In this study, a total of 150 patients were included. Overall, a significant number of patients (p -value 0.0009) were adults from the reproductive age group of 25-44 years of age. The regional distribution of patients showed that most patients were from rural areas (60%) (p value = 0.0005). The use of NCS was divided into 11 steps and a significant proportion of patients were using NCS incorrectly (p-value < 0.0001). The detailed instructions about the correct use of NCS were given to patients both verbally and practically performed in front of them. In addition, written material was also provided in the native language along with a graphical explanation. After 15 days of follow-up, a significant number of patients showed a correct use of the NCS technique after intervention (p-value < 0.0001). The pre-intervention and post-intervention data showed that 905 patients who were using NCS incorrectly after the intervention reduced significantly to 10% (p-value < 0.0001). In conclusion, the management of rhinitis and intranasal spray technique competency of the majority of pharmacists as well as rhinitis patients was observed to be inappropriate. However, an educational intervention was effective in substantially enhancing the competency of study subjects regarding the INCS technique. Intranasal technique was observed to be associated with satisfaction and adherence with nasal spray and significantly affected rhinitis control.

Conclusions

Pharmacist-Led educational intervention has increased the pharmacists' and patients' knowledge, and they are regarded as an integral part of the study due to their positive outcomes, The disease ratio has decreased, and patient Pharmacists are well-versed in INCS technique administration and management of AR, which has resulted in fewer patients, fewer self- medication side effects, and less disease transmission. This study will play a major role in the field of INCS correct administration and upgrade pharmacist knowledge and new researchers can gain benefits from this research.

References:

1. Bourdin A, Gras D, Vachier I and Chanez P (2009). Upper airway 1: Allergic rhinitis and asthma: united disease through epithelial cells. Thorax, 64(11): 925- 935.
2. Bousquet J, Van Cauwenberge P, Ait Khaled N, Bachert C, Baena- Cagnani C.E, Bouchard J, Bunnag C, Canonica GW, Carlsen KH, Chen YZ and Cruz AA (2006). Pharmacologic and anti-IgE treatment of allergic rhinitis ARIA update(in collaboration with GA2LEN). Allergy, 61(9): 1086-1096.
3. Bridgeman MB (2017). Overcoming barriers to intranasal corticosteroid use in patients with

uncontrolled allergic rhinitis. Integr Pharm Res Pract, 4(6): 109-119.
4. Di Lorenzo G, Pacor M, Pellitteri M., Morici G, Di Gregoli A, Lo Bianco C, Ditta V, Martinelli N, Candore G, Mansueto P and Rini GB (2004). Randomized placebo- controlled trial comparing fluticasone aqueous nasal spray in mono- therapy, fluticasone plus cetirizine, fluticasone plus montelukast and cetirizine plusmontelukast for seasonal allergic rhinitis. Clin Exp Allergy, 34(2): 259-267.
5. Dykewicz MS and Hamilos DL (2010). Rhinitis and sinusitis. J Allergy Clin Immunol, 125(2): 103-115.
6. Hoang MP, Chitsuthipakorn W, Seresirikachorn K and Snidvongs K improvement in daytime and nighttime nasal symptoms of seasonal allergic rhinitis compared withmontelukast. Ann Allergy Asthma Immunol, 90(5): 536-542.
7. Kaszuba SM., Baroody FM, deTineo M, Haney L, Blair C and Naclerio RM (2001).
8. Superiority of an intranasal corticosteroid compared with an oral antihistamine inthe as- needed treatment of seasonal allergic rhinitis. Arch Int med, 161(21): 2581-2587
9. Laforce CF, Dockhorn RJ, Findlay SR, Meltzer EO, Nathan RA, Stricker W, Weakley S,Field EA and Rogenes PR(1994). Fluticasone propionate: an effective alternative treatment for seasonal allergic rhinitis in adults and adolescents. J Fam Pract, 38(2): 145- 152.
10. Lohia S, Schlosser RJ and Soler ZM. (2013). Impact of intranasal corticosteroids on asthma outcomes in allergic rhinitis: a meta- analysis. Allergy, 68(5): 569-579.
11. Meltzer EO (2001). Quality of life in adults and children with allergic Rhinitis. JAllergy Clin Immunol, 108(1): 45-53.
12. Pullerits T, Praks L, Skoogh, BE, Ani R and Lotvall J (1999). Randomized placebo- controlled study comparing a leukotriene receptor antagonist and a nasal glucocorticoid in seasonal allergicrhinitis. Am J Respir Crit Care Med, 159(6):1814-1822
13. Ratner PH, Howland III WC, Arastu R, Philpot EE, Klein KC, Baidoo CA, Faris MA. and Rickard KA (2003). Fluticasone propionate aqueous nasal spray provided significantly greater Rhinitis. J Allergy Clin Immunol, 108(1): 45-53.
14. Siddiqui MI, Dhanani R and Moiz H (2020). Prevalence of allergic rhinitis among healthcare workers and its impact on their work: A cross-sectional survey at atertiary healthcare centre in Pakistan. J Pak Med Assoc, 70(8): 1432.
15. Siddiqui ZA, Walker A, Pirwani MM, Tahiri M and Syed I (2022). Allergic rhinitis: Diagnosis and management. Br J Hosp Med (Lond), 83(2): 1-9.
16. Small EO (2022). As- needed intranasal corticosteroid spray for allergic rhinitis: a systematic review and meta-analysis. Rhinology, 60(4): 242-251.
17. Stokes M, Amorosi SL, Thompson D, Dupclay L, Garcia J and Georges G (2004). Evaluation of patients' preferences for triamcinolone acetonide aqueous, fluticasone propionate, and mometasone furoate nasal sprays in patients with allergic rhinitis. Otolaryngol Head Neck Surg, 131(3): 225-231.

Table 1: Demographics of pharmacy setup: Pharmacist n=100.

Variable	Categories	Frequency/ percentage	p-value
Area	Rural	35	0.0008
	Urban	63	
Pharmacy type	Chain Pharmacy	37	< 0.0001
	Individual Pharmacy	70	
Duration of pharmacy setup	< 1 year	9	< 0.0001
	1- 3 years	29	
	3.1- 6 years	35	
	6.1- 9 years	12	
	More than 9 years	14	

Table 2: Demographics of pharmacy setup: Pharmacist n=100.

Variable	Categories	Frequency/ percentage	p-value
Area	Rural	35	0.0008
	Urban	63	
Pharmacy type	Chain Pharmacy	37	< 0.0001
	Individual Pharmacy	70	
Duration of pharmacy setup	< 1 year	9	< 0.0001
	1- 3 years	29	
	3.1- 6 years	35	
	6.1- 9 years	12	
	More than 9 years	14	

Table 3: Demographics of pharmacists (n = 100).

Variable	Categories	Frequency	p-value
What is patient main symptom	Sneezing	51	< 0.0001
	itchy nose	33	
	nasal congestion	18	
	Watery nose	3	
	itchy eyes	0	
How long patient had these symptoms	1 day	10	< 0.0001
	3 days	39	
	7 days	51	
Do the patient have the symptoms all the time or do They come and go	All time	45	0.1585
	Occasionally	55	
Are the patient aware of anything that seems to bring the symptoms on	such as being outdoors	16	< 0.0001
	pollen seasons	35	
	contact with animals	19	
	something patient handle at work	30	
	or at home		
Has a doctor ever diagnosed patient	with hay fever	10	< 0.0001
	allergic rhinitis	85	
	Asthma	5	
Is patient nasal discharge	Clear	39	< 0.0001
	Watery	61	
Are patient experiencing any wheezing or shortness of breath	Yes	43	< 0.0001
	No	57	
Do patient have an earache orany pain in face	Yes	42	< 0.0001
	No	58	
Do patient have allergic rhinitis	Yes	90	< 0.0001
	No	10	
Do patient eyes burn	Yes	20	< 0.0001
	No	80	
Do patient have dry eyes	Yes	45	< 0.0001
	No	55	
Does patient have photophobia	Yes	13	< 0.0001
	No	87	
Which local corticosteroid mostly prescribed for treatment of AR	Budesonide	40	< 0.0001
	Fluticasone	25	
	Mometasone forate	9	
	Fluticasone with azelastine	20	
	Other	6	
How long do you recommend treatment with local corticosteroid in AR patients	7 days	33	< 0.0001
	14 days	46	
	1 month	21	
At what frequency INCS shouldbe given?	Every day	36	< 0.0001
	Alternate days	20	
	Alternate weeks	23	
	Other	21	

When prescribing INCS which of the following do you pay attention to	Time of day to administer it	15	< 0.0001
	How to use the nasal spray	56	
	How to position the device	10	
	Position of the body	5	
	Doing it with nasal washing	14	
	Other	10	
What side effect you most	Epistaxis	24	< 0.0001

Table 4. Pharmacist knowledge of AR and NCS Post-Intervention (n = 100).

Variable	Categories	Frequency	p-value
What is patient main symptom	Sneezing	76	< 0.0001
	itchy nose	48	
	nasal congestion	23	
	Watery	3	
	itchy eyes	7	
How long patient had these symptoms	1 day	10	< 0.0001
	3 days	89	
	7 days	51	
Do the patient have the symptoms all the time or do they come and go	All time	45	0.1365
	Occasionally	105	
Are the patient aware of anything that seems to bring the symptoms on	such as being outdoors	16	< 0.0001
	pollen seasons	45	
	contact with animals	56	
	something patient handle at work or at home	33	
Has a doctor ever diagnosed patient	with hay fever	10	< 0.0001
	allergic rhinitis	95	
	Asthma	45	
Is patient nasal discharge	Clear	89	< 0.0001
	watery	61	
Are patient experiencing any wheezing or shortness of breath	Yes	39	< 0.0001
	No	111	
Do patient have an earache or any pain in face	Yes	42	< 0.0001
	No	108	
Do patient have allergic rhinitis	Yes	100	< 0.0001
	No	50	
Do patient eyes burn	Yes	20	< 0.0001
	No	130	
Do patient have dry eyes	Yes	45	< 0.0001
	No	105	
Does patient have photophobia	Yes	13	< 0.0001
	No	137	
Which local corticosteroid mostly prescribed for treatment of AR	Budesonide	40	< 0.0001
	Fluticasone	25	
	Mometasone forate	36	
	Fluticasone in combination with azelastine	40	
	Other	9	
How long do you recommend treatment with local corticosteroid in AR patients	7 days	39	< 0.0001
	14 days	88	
	1 month	23	
At what frequency INCS should be given?	Every day	36	< 0.0001
	Alternate days	68	
	Alternate weeks	23	
	Other	21	
When prescribing INCS which of the following do you pay attention to	Time of day to administer it	15	< 0.0001
	How to use the nasal spray	96	
	How to position the device	10	

	Position of the body	5	
	When to do it with nasal washing	14	
	Other	10	
What side effect you mostfrequently see after prolonged use of INCS	Epistaxis	24	< 0.0001
	Headache	49	
	Hyposmia	56	
	Hiccups	19	
	Nasal dryness	20	
	Other	6	
Which of these factors do you see as contraindicated by use of INCS	Risk of hemorrhage	16	< 0.0001
	Hypertension	18	
	Glaucoma	12	
	Diabetes	29	
	Immunosuppression	55	
	Herpes simplex	26	
	Other	10	
What is maximum daily dose of INCS	1-2drops	38	< 0.0001
	3-4drops	67	
	4-5drops	26	
	6-7drops	19	
Have patient ever had asthma	Yes	89	< 0.0001
	No	61	
Have the patient had difficulty in sleeping	Yes	92	< 0.0001
	No	58	p-value
Have the patient had whisling or wheezing of the chest	Yes	77	< 0.0001
	No	73	
Have the patient is using inhaler	Yes	90	
	No	60	

Table 5. Classification of AR patients bases on clinical presentation.

Symptoms	**Presentation**	**Score**
Sneezing	None	0
	1-5 times/day	1
	6-10 times/day	2
	>10 times/day	3
Runny Nose	None	0
	1-5 times/day	1
	6-10 times/day	2
	>10 times/day	3
Stiffness	None	0
	Mild, without mouth-breathing	1
	Moderate. With occasional mouth-breathing	2
	Severe, with frequent mouth-breathing	3

Table 6. Categories of AR patients

Category	**No. of Patients (%)**
Intermittent	10 (10%)
Persistent	22 (22%)
Mild	40 (40%)
Moderate-Severe	28 (28%)

Table 7. NCS technique of pharmacists- pre intervention (n =100).

No	Steps	Incorrect /Skipped	Correct	p-value
1	**Clean hands before applying a nasal spray**	76	24	< 0.0001
2	**Make sure that intranasal- spray device is working Properly**	59	41	0.0107
3	**Shake the bottle well before use**	52	48	0.5686
4	**Remove the cap**	66	34	< 0.0001
5	**Clean the nose**	67	33	< 0.0001
6	**Then bend your head straight forward and bring your chin to your chest**	56	44	0.8914
7	**Hold the spray in your opposite hand to the nostril in which you are near to apply the spray**	62	38	< 0.0001
8	**Using the opposite hand to the nostril being treated, place the end of the spray bottle just inside the nostril away from the septum pointing to theearoreye**	73	27	< 0.0001
9	**Then activate the spray**	66	34	< 0.0001
10	**Change your hands and repeat this action in the other nostril**	45	55	0.1585
11	**A spray can be used either in the morning, or evening, or both**	38	62	< 0.0001

Table 8. NCS technique of pharmacists- post-intervention.

	Steps	Incorrect	Correct	p-value
1	**Clean hands before applying a nasal spray**	10	90	< 0.0001
2	**Make sure that intranasal- spray device is working Properly**	5	95	< 0.0001
3	**Shake the bottle well before use**	12	88	< 0.0001
4	**Remove the cap**	16	84	< 0.0001
5	**Clean the nose**	22	78	< 0.0001
6	**Then bend your head straight forward and bring your chin to your chest**	3	97	< 0.0001
7	**Hold the spray in your opposite hand to the nostril in which you are near to apply the spray**	9	91	< 0.0001
8	**Using the opposite hand to the nostril being treated, place the end of the spray bottle just inside the nostril away from the septum pointing to the ear or eye**	6	94	< 0.0001
9	**Then activate the spray**	4	96	< 0.0001
10	**Change your hands and repeat this action in the other Nostril**	8	92	< 0.0001
11	**A spray can be used either in the morning, or evening, or both**	10	92	< 0.0001

Table 9. Effect of intervention on NCS technique knowledge.

No	Steps	Pre-Intervention		Post-Intervention		Chi- square p-value
		Incorrect	Correct	Incorrect	Correct	
1	**Clean hands before applying a nasal spray**	76	24	10	90	< 0.0001
2	**Make sure that intranasal- spray device is working properly**	59	41	5	95	< 0.0001
3	**Shake the bottle well before use**	52	48	12	88	< 0.0001
4	**Remove the cap**	66	34	16	84	< 0.0001
5	**Clean the nose**	67	33	34	66	0.00175
6	**Then bend your head straight forward and bring your chin to your chest**	56	44	23	77	0.00412
7	**Hold the spray in your opposite hand to the nostril in which you are near to apply the spray**	62	38	26	74	0.0009
8	**Using the opposite hand to the nostril being treated, place the end of the spray bottle just inside the nostril away from the septum pointing to the ear or eye**	73	27	11	89	< 0.0001

9	**Then activate the spray**	66	34	19	81	< 0.0001
10	**Change your hands and repeat this action in the other nostril**	45	55	18	82	< 0.0001
11	**A spray can be used either in the morning, or evening, orboth**	38	62	10	90	< 0.0001

Table 10. Adequacy of Pharmacists (Pre and post intervention).

Competency in INCS Technique	Pre-Intervention	Post-Intervention	P Value (McNemar)
Competent	29 %	48 %	0.0057
Non-Competent	71 %	52 %	

Table 11. Effect of intervention on level of demonstration.

Level of Demonstration	Pre- Intervention (%)	Post- Intervention(%)	P Value (McNemar)
Verbally described only	62	33	0.0004
Verbally described and physically Demonstrated	26	74	

Table 12 Association of demographic variables with competency post-intervention in pharmacists.

Demographic Variable	Categories	Non-Competent (%)	Competent (%)	P value (Pearson Chi- Square)
Gender	Male	35	36	0.020
	Female	7	22	
Marita lstatus	Married	26	15	0.781
	Not Married	39	20	
Age group	25-30	35	37	0.136
	30-50	9	19	
Education	Pharm D	32	35	< 0.0001
	M. Phil	4	29	
Experience	</= 5 years	41	30	0.935
	> /= 5 Years	17	12	
Training	Yes	1	19	< 0.0001
	No	57	23	
Location	Rural	23	13	0.890
	Urban	40	24	
Type of pharmacy	Chain	10	21	0.005
	Urban	43	26	

Table 13. Patient's Demographics data (n= 150).

	Variable	Categories	Frequency (N)	%a ge (%)	p-value
	Gender	Male	76	50.6	0.8181
		Female	74	49.4	
2	Age	18-24 years	7	4.6	0.0009
		25-44 years	103	68.6	
		45-64 years	32	21.3	
		>65 years	8	5.3	
4	BMI	Underweight	4	2.6	0.0004
		Normal	96	64.0	
		Overweight	22	14.6	
		Obese	28	18.6	
5	Address/ Location	Rural	90	60.0	0.0005
		Urban	60	40.0	
6	Race/ Ethnicity	Punjabi	104	69.3	0.0019
		Pathan	26	17.3	
		Others	20	13.4	
7	Education Status	Not Educated	53	36	0.0001
		Primary	22	14.6	
		Secondary	12	8.0	
		Matriculation	20	13.4	

		College	23	15.3	
		Graduation	20	13.4	
8	Marital Status	Married	87	58.0	0.0051
		Not Married	63	42.0	

Table 14. Clinical Symptoms, history and medication usage in AR patients.

Variable	Categories	Quency (N) %	age (%)	p-value
Symptoms of AR	Rhinorrhea	138	92	<0.0001
	Sneezing	122	81.3	<0.0001
	Nasal congestion	135	90	<0.0001
	Nasal itching	109	72.6	<0.0001
	Itchy eyes	35	23.3	<0.0001
	Watery eyes	78	52	<0.0001
	Cough	45	30	<0.0001
	Dysosmia	89	59.3	<0.0001
smoking History	Smoker	29	19.3	0.0019
	Ex-Smoker	20	13.3	
	Never smoked	101	67.3	
Allergic History	Allergic patient	57	38.0	< 0.0001
	Ex-allergic patient	20	13.4	
	No Allergic History	73	48.6	
Seasonal Allergy History	Seasonal allergic Patient	26	17.3	< 0.0001
	Ex-seasonal patient	43	28.6	
	No seasonal History	81	54.0	
Asthmatic History	Asthmatic	137	91.3	< 0.0001
	Ex- asthmatic patient	13	8.7	
	No Asthma History	0	0	
Socio-economic Status	Low Class	54	36.0	0.0019
	Middle Class	88	58.6	
	Upper Class	8	5.4	
Duration of Disease (AR)	0-5 years	54	36.0	0.0019
	6-10 years	66	44.0	
	>10 years	33	22.0	
Duration of using NCS	0-5 years	87	58.0	0.0019
	6-10 years	48	32.0	
	>10 years	15	10.0	
Medication administered through NCS	Reliever	54	36.0	0.0091
	Nasal Corticosteroid	42	28.0	
	NCS	54	36.0	
NCS instructional methods	Never instructed	13	8.6	< 0.0001
	Verbally instructed	107	71.4	
	Verbally instructed+ written material provided	30	20	
Frequency of NCS use	As Needed	90	60.0	0.0005
	As prescribed	60	40.0	
Assistance reading health literature	Assistance required	58	38.6	< 0.0001
	Assistance not required	92	61.4	
Nasal examinations	Abnormal nasal mucosa	38	25.3	< 0.0001
	Abnormal structure	22	14.6	
	Increased nasal secretions	90	60	

Table 15. Impact of AR on life activities and overall discomfort.

Impact of AR	Yes (n)	No (n)	p-value
Sleep	90	60	< 0.0001
Work life	110	40	< 0.0001
Social activities	41	110	< 0.0001
Physical activities	40	112	< 0.0001
Impact of AR on quality of life (0-3 scale)			

None (0)	7	147	< 0.0001
Mild (1)	27	128	
Moderate (2)	86	60	
Severe (3)	32	114	
Headache	92	54	< 0.0001
Concentration difficulties	121	29	< 0.0001
Reading Difficulties	107	45	< 0.0001
Speaking difficulty	46	102	< 0.0001
Contagious aspect	88	63	< 0.0001
Physical appearance	70	77	< 0.0001

Table 16. Pre-intervention Knowledge about correct use of NCS.

No	Steps	Incorrect	Correct	p-value
1	Clean hands before applying a nasal spray	92	58	0.0008
2	Make sure that intranasal- spray device is working properly	53	97	< 0.0001
3	**Shake the bottle well before use**	101	49	< 0.0001
4	**Remove the cap**	113	37	< 0.0001
5	**Clean the nose**	54	96	< 0.0001
6	Then bend your head straight forward and bringyour chin to your chest	102	48	< 0.0001
7	Hold the spray in your opposite hand to the nostril in which you are near to apply the spray	64	86	0.0118
8	**Using the opposite hand to the nostril being treated, place the end of the spray bottle just inside the nostril away from the septum pointing to the ear or eye**	110	40	< 0.0001
9	Then activate the spray	65	85	0.0208
10	Change your hands and repeat this action in the other nostril	145	5	< 0.0001
11	A spray can be used either in the morning, or evening, or both	128	22	< 0.0001

Table 17. Post-intervention Knowledge about correct use of NCS.

No	Steps	Incorrect	Correct	p-value
1	Clean hands before applying a nasal spray	22	128	< 0.0001
2	Make sure that intranasal- spray device is workingproperly	18	132	< 0.0001
3	**Shake the bottle well before use**	01	149	< 0.0001
4	**Remove the cap**	13	137	< 0.0001
5	**Clean the nose**	54	96	< 0.0001
6	Then bend your head straight forward and bring your chin to your chest	02	148	< 0.0001
7	Hold the spray in your opposite hand to the nostril in which you are near to apply the spray	24	126	< 0.0001
8	**Using the opposite hand to the nostril being treated, place the end of the spray bottle just inside the nostril away from the septum pointing to the ear or eye**	30	120	< 0.0001
9	Then activate the spray	35	115	0.0208
10	Change your hands and repeat this action in the other nostril	25	125	0.2501
11	A spray can be used either in the morning, or evening,or both	21	129	< 0.0001

Table 18. Patient Adherence on the usage of NCS.

Questions	ery (5)	airly (4)	ewhat (3)	Not very (2)	Hardly at all (1)	p-value
1. It was easy to learn how to use 2. the nasal spray?	41	90	8	8	3	< 0.0001
3. Was it easy to prepare the nasal 4. spray for use?	26	106	14	1	3	< 0.0001
5. Was it easy to use the nasal spray?	11	114	18	7	0	< 0.0001
6. Was it easy to keep the nasal 7. spray clean and in good working condition?	9	100	39	1	1	< 0.0001
8. Was it easy to continue normal	7	107	17	14	5	< 0.0001

activities with the use of the nasal 9. spray?						
10. Did the nasal spray fit your 11. nostrils comfortably?	0	63	58	26	3	< 0.0001
12. Was using the nasal spray easy in 13. terms of size and weight?	9	118	12	10	1	< 0.0001
14. Was it easy to carry the nasal 15. spray with you?	21	108	21	0	0	< 0.0001
16. After you've used the nasal spray, 17. do you have the feeling that you used it correctly?	20	87	43	0	0	< 0.0001
18. By, considering your responses to 19. the previous questions, were you Satisfied with the nasal	88	53	9	0	0	< 0.0001
spray?						

Table 19. Patient's response to adherence of nasal spray.

Questions	**ery (5)**	**airly (4)**	**omewh at(3)**	**t very (2)**	**Hardly at all (1)**	**p-value**
1. Was it being easy to learn how to 2. use the nasal spray?	41	90	8	8	3	< 0.0001
3. Was it easy to prepare the nasal 4. spray for use?	26	106	14	1	3	< 0.0001
5. Was it easy to use the nasal spray?	11	114	18	7	0	< 0.0001
6. Was it easy to keep the nasal spray clean and in good working 7. condition?	9	100	39	1	1	< 0.0001
8. Was it easy to continue normal activities with the use of the nasal 9. spray?	7	107	17	14	5	< 0.0001
10. Did the nasal spray fit your 11. nostrils comfortably?	0	63	58	26	3	< 0.0001
12. Was using the nasal spray easy in terms of size and weight?	9	118	12	10	1	< 0.0001
13. Was it easy to carry the nasal 14. spray with you?	21	108	21	0	0	< 0.0001
15. After you've used the nasal spray, 16. do you have the feeling that you used it correctly?	20	87	43	0	0	< 0.0001
17. Overall, considering your responses to the previous 18. questions, were you Satisfied with the nasal spray?	88	53	9	0	0	< 0.0001

Table 20. Satisfaction level with NCS in RA patients (pre-intervention).

Variable	**Category**	**Frequency (%)**	**p-value**
Satisfaction with NCS	Low satisfaction	121 (80)	< 0.0001
	High satisfaction	29 (20)	

Table 21. Satisfaction level with NCS in RA patients (post-intervention).

Variable	**Category**	**Frequency (%)**	**p-value**
Satisfaction with NCS	Low satisfaction	102 (68)	< 0.0001
	High satisfaction	48 (32)	

Table 22. Satisfaction with NCS pre- and post-intervention.

Variable	**Category**	**Pre-intervention**	**Post-intervention**	**p-value**
Satisfaction with NCS	Low satisfaction	121 (80)	102 (68)	< 0.0001
	High satisfaction	29 (20)	48 (32)	

Table 23. Statistical association of satisfaction with NCS.

Variable	**Category**	**Frequency (%)**	**Poor Technique**	**Moderate Technique**	**Good Technique**	**p- value**
Satisfaction with NCS	Low satisfaction	102 (68)	56 (55)	35 (34)	11 (11)	< 0.0s01
	High satisfaction	48 (32)	4 (8)	20 (42)	24 (50)	