



Optimizing Allergic Rhinitis Management: The Role of Pharmacist-Led Educational Programs in Improving Patient Knowledge

Syed Muhammad Ali ^{1*}, Wafa Ishaq ¹, Ramla Shabbir ², Rukhsar Imran ¹

¹ Lecturer, Faculty of Pharmacy, The University of Lahore

² Assistant Professor, Faculty of Pharmacy, The University of Lahore

ARTICLE INFO

2024 Volume 1, Issue 1
<https://www.doi.org/pdr.2024.tgc.302>

Article History:

Received: May 18, 2024

Accepted: May 28, 2024

Published: Jun 29, 2024

Citation: S M Ali, W Ishaq, R Shabbir, R Imran. (2024). Insights on Allergic Rhinitis Management and Impact of Pharmacist-Led-Educational Intervention on Patient's Knowledge. *Pharmacology and Drug Research. The Geek Chronicles.* 1(1): 1-22

Copyright: © 2024 Syed Muhammad Ali, this is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

Keywords: Allergic Rhinitis, pharmacist, NCS, McNamar, ARC.

ABSTRACT

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

Aims: The present study aimed to assess the impact of educational intervention on the management of allergic rhinitis

Method: The 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. Allergic rhinitis management of patients was evaluated through skin prick test and Management of 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 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 and were 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).

Impact Statement: Continued Education is necessary for all health 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]. Allergic rhinitis 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 allergic rhinitis 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 neighbors 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 allergic rhinitis [4-7].

Common symptoms of allergic rhinitis 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 N/A or controls. In Pakistan, 19.2 % of the population experienced allergic rhinitis, 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, allergic rhinitis is categorized as seasonal (recurring over time) or chronic (occurs year-round). Not all patients, however,

are participating in this separation program. 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 genuine symptoms. Four days each week and over four consecutive [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

Allergic Rhinitis 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 bump 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 therapy of allergic rhinitis is largely dependent on drug adherence and intranasal corticosteroid therapy is considered the most essential treatment. The application of which is contingent upon proper intranasal corticosteroid spray technique. Improving patients' understanding of intranasal corticosteroid spray would result in greater adherence and, subsequently, improved treatment outcomes for allergic rhinitis. In the treatment of allergic rhinitis, intranasal corticosteroid therapy is necessary. Even though incredibly effective intranasal treatments are available now, allergic rhinitis remains uncontrolled on a global scale. The most prevalent reasons for poor control of allergic rhinitis include lack of patient education, higher drug costs, limited access to

health care, and lack of application of guidelines for treatment and management of allergic rhinitis [9-10,12].

Although each therapy approach will lessen a patient's AR symptoms, physicians should personalize the treatment choice to the patient's specific needs. Each of the above situations would need distinct considerations:

- Individual with nasal congestion as the major complaint,
- Individual with intermittent or episodic nasal AR symptoms,
- Individual with mild AR symptoms,
- Individual with moderate to severe AR symptoms

Over-the-counter medication has increased the role of pharmacists in the early diagnosis of AR and without mixing it with common flu. Pharmacists can play a wide role in the management of AR as it should be managed according to symptoms and their severity by adjusting the dose of patients and having a look at the daily routine of patients. Thus, by educating the patients about AR and the proper administration techniques of INCS, the pharmacist can guide the patients well and accordingly. Pharmacist-led educational intervention programs can play a vital role in this regard; awareness tools increase the patient's knowledge and know-how about the disease

Rhinitis treatment with intranasal corticosteroid spray is highly dependent on the patient's manner of administration. However, both patients and healthcare professionals have insufficient awareness of the optimal approach for using INCS. Several studies demonstrate that improper INCS method in patients is the consequence of poor INCS technique teaching by medical professionals. Pharmacy practitioners are at the forefront of dispensing and instructing patients on medication-related methods. It is the pharmacist's responsibility to educate patients on the optimal usage of their drugs [13]. The role of the pharmacist in managing difficulties such as confirming the existence of AR, choosing a course of therapy,

encouraging patient self-management, and long-term monitoring. Are pharmacists playing a critical role in instructing patients on how to properly utilize INCS spray? In light of this, the study's justification 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 allergic rhinitis management issues, such as confirming the presence of AR, choosing a course of treatment, patient self-management, and the impact of pharmacist-led educational interventions on community pharmacists 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 number BEC-FBS-QAU2022-394.

Method

Prospective observational research was conducted to evaluate the knowledge of pharmacists regarding the management of rhinitis and allergic rhinitis patients along with the effect of educational intervention provided to them regarding the correct technique of use of "intranasal corticosteroid spray". A bi-phasic study was conducted, involving two sections, a prospective observational study on pharmacists & 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 allergic rhinitis. 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 & handling, and 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 %ages and frequencies, while quantitative variables were shown as means and standard deviations. To determine associations between independent variables, chi-square tests (Pearson chi-square) were used, and 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 recent study, 100 community pharmacists were included to evaluate their knowledge about the use of NCS. The demographic data of pharmacy setup and pharmacists. 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 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).

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 | |

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 that a significantly higher proportion (72%) of young

pharmacists between the age 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

Table 2: 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 or any 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 should be 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 | |
| What side effect you most | Doing it with nasal washing | 14 | < 0.0001 |
| | Other | 10 | |
| What side effect you most | Epistaxis | 24 | < 0.0001 |

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, water nose, and itchy eyes), duration of symptoms (one day, three days, and seven days), presence of symptoms (occasional or all the time), information regarding for 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 face pain, history of allergic rhinitis, eye burns, dry eyes, photophobia, prescribed treatment of AR (Budesonide, Fluticasone, Mometasone forate, 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 instruction d=for NCS, usage instruction for NCS, side effects of NCS, contradictory factors of NCS, maximum daily usage of NCS, history of asthma and usage of inhales was also collected from all pharmacists (Figure 3.3).

Table 3. 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 | |
| | such as being outdoors | 16 | < 0.0001 |
| | pollen seasons | 45 | |

| | | | |
|------------------------------------------------------------------------------|---------------------------------------------|-----|----------|
| Are the patient aware of anything that seems to bring the symptoms on | 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 forte | 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 most frequently 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 whistling or wheezing of the chest | Yes | 77 | < 0.0001 |
| | No | 73 | |
| Have the patient is using inhaler | Yes | 90 | |
| | No | 60 | |

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; shake the bottle before use (52%), remove the cap (66%), clear the nose (67%), using the opposite hand to the nostril being treated, place the end of the spray bottle just inside the nostril aiming away from the septum pointing to the ear or eye (73%), and activate 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” shake the bottle before use was correctly performed by 90% (p -value < 0.0001), step 4” remove the cap” was correctly performed by 88% (p -value 0.0001), step5 “clear the nose” was correctly performed by 78% (p -value < 0.0001), step 8 “Using the opposite hand to the nostril being treated, place 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 “ activate 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) is observed for each step. There is a significant difference in the proportion of pharmacists who correctly demonstrates 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% 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 and scored < 5 and 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 by education level (p-value 0.044). Male pharmacists were more competent than female (p-value 0.020). The pharmacists with M.Phil. degree showed higher competency as compared to PharmD 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 pharmacist who had not received any relevant training on NCS techniques. In addition, type of pharmacy was also found as a significant factor that affect 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

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 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 impact 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 meter NCS usage resulted in boosting the level of satisfaction of patients with their NCS. The statistical analysis of the sensation of satisfaction as the outcome of educational intervention. To establish statistically the relationship between NCS method and satisfaction with NCS, a Pearson chi-square analysis is employed. There is 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 indicates a statistically significant relationship between these two variables.

Table 4. 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 5. Categories of AR patients

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

Table 6. 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 the ear or eye | 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 7. NCS technique of pharmacists- post-intervention.

| No | 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 8. 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, or both | 38 | 62 | 10 | 90 | < 0.0001 |

Table 9. 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 10. 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 11. 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 | |
| Marital status | Married | 26 | 15 | 0.781 |
| | Not Married | 39 | 20 | |
| Age group | 25-30 | 35 | 37 | 0.136 |
| | 30-50 | 9 | 19 | |
| Education | PharmD | 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 12. Patient's Demographics data (n= 150).

| No | Variable | Categories | Frequency (N) | Percentage (%) | p-value |
|----|----------|-------------|---------------|----------------|---------|
| 1 | 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 | |
| 3 | BMI | Underweight | 4 | 2.6 | 0.0004 |
| | | Normal | 96 | 64.0 | |

| | | | | | |
|---|----------------------|---------------|-----|------|--------|
| | | Overweight | 22 | 14.6 | |
| | | Obese | 28 | 18.6 | |
| 4 | Address/ Location | Rural | 90 | 60.0 | 0.0005 |
| | | Urban | 60 | 40.0 | |
| 5 | Race/ Ethnicity | Punjabi | 104 | 69.3 | 0.0019 |
| | | Pathan | 26 | 17.3 | |
| | | Others | 20 | 13.4 | |
| 6 | 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 | |
| 7 | Marital Status | Married | 87 | 58.0 | 0.0051 |
| | | Not Married | 63 | 42.0 | |

Table 13. Clinical Symptoms, history and medication usage in AR patients.

| Variable | Categories | Frequency (N) | Percentage (%) | 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 14. 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 15. 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 bring your 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 another nostril | 145 | 5 | < 0.0001 |
| 11 | A spray can be used either in the morning, or evening, or both | 128 | 22 | < 0.0001 |

Table 16. 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 working properly | 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 17. Patient Adherence on the usage of NCS.

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

Table 18. Patient's response to adherence of nasal spray.

| Questions | Very (5) | Fairly (4) | Somewhat (3) | Not very (2) | Hardly at all (1) | p-value |
|----------------------------------------------------------------------------|----------|------------|--------------|--------------|-------------------|----------|
| Was it being easy to learn how to use the nasal spray? | 41 | 90 | 8 | 8 | 3 | < 0.0001 |
| Was it easy to prepare the nasal spray for use? | 26 | 106 | 14 | 1 | 3 | < 0.0001 |
| Was it easy to use the nasal spray? | 11 | 114 | 18 | 7 | 0 | < 0.0001 |
| Was it easy to keep the nasal spray clean and in good working condition? | 9 | 100 | 39 | 1 | 1 | < 0.0001 |
| Was it easy to continue normal activities with the use of the nasal spray? | 7 | 107 | 17 | 14 | 5 | < 0.0001 |
| Did the nasal spray fit your nostrils comfortably? | 0 | 63 | 58 | 26 | 3 | < 0.0001 |

| | | | | | | |
|---------------------------------------------------------------------------------------------------------|----|-----|----|----|---|----------|
| Was using the nasal spray easy in terms of size and weight? | 9 | 118 | 12 | 10 | 1 | < 0.0001 |
| Was it easy to carry the nasal spray with you? | 21 | 108 | 21 | 0 | 0 | < 0.0001 |
| After you've used the nasal spray, do you have the feeling that you used it correctly? | 20 | 87 | 43 | 0 | 0 | < 0.0001 |
| Overall, considering your responses to the previous questions, were you Satisfied with the nasal spray? | 88 | 53 | 9 | 0 | 0 | < 0.0001 |

Table 19. 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 20. 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 21. 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 22. 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) | |

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.

Conclusion

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.

Reference

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 plus montelukast 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 with montelukast. *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 in the 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. *J Allergy 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 allergic rhinitis. *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 a tertiary 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.