

**A STUDY OF ALLERGIC RHINITIS PATIENTS' ADHERENCE TO
INTRANASAL CORTICOSTEROID SPRAY IN HOSPITAL KUALA
LUMPUR**

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ABSTRAK (BAHASA MELAYU)

Pengenalan: Alahan resdung adalah keradangan mukosa di rongga hidung yang disebabkan oleh allergen pada kebiasaannya. Kadar alahan resdung di rantau negara Asia Pasifik ialah 2.3%-7.1%. Pematuhan ubatan klinikal ialah penggunaan 80% atau lebih daripada ubat yang ditentukan kepada pesakit. **Objektif:** Kajian ini dijalankan untuk menentukan faktor-faktor yang mempengaruhi pematuhan klinikal penggunaan ubat sedutan kortikosteroid intranasal di kalangan 185 pesakit alahan resdung yang menghadiri klinik ORL di Hospital tertiar Kuala Lumpur. **Kaedah:** Ini adalah satu kajian pemerhatian deskriptif dimana borang soal-selidik digunakan untuk mengumpul data. 'Simple and Multiple Logistic Regression' data dianalisa untuk menentukan faktor-faktor yang mempengaruhi pematuhan klinikal. Kebenaran etika diperolehi oleh NMMR. **Keputusan:** Kadar respon kajian adalah 93% merangkumi 185 Responden berusia dari 18 hingga 74 tahun. Kebanyakan ialah responden wanita (59.5%). Prevalen pematuhan klinikal penggunaan ubat sedutan kortikosteroid intranasal ialah 58.9%. Terdapat perhubungan signifikan diantara faktor tahap IgE serum [$X^2(1) = 8.37$, $p=0.004$], jenis kutu hama habuk DP [$X^2(1) = 5.15$, $p=0.023$], skor tinggi simptom hidung sewaktu lawatan pertama [$X^2(2) = 37.02$, $p=0.001$] dan kedua [$X^2(2) = 10.30$, $p=0.006$]. Selain itu, didapati faktor risiko untuk pematuhan klinikal penggunaan ubat sedutan kortikosteroid adalah responden yang mempunyai alahan jenis DP (OR:2.13, $p<0.001$), tahap IgE serum yang tinggi (OR:2.69, $p<0.004$) dan skor tinggi simptom hidung sewaktu lawatan pertama di klinik ORL (OR:15.13, $p<0.001$). Didapati responden lelaki 2.481 kali lebih mematuhi pematuhan klinikal penggunaan ubat sedutan kortikosteroids daripada perempuan (AOR:2.481, 95% CI:1.140-5.397). Responden bukan Melayu adalah 3.683 kali lebih mematuhi pematuhan klinikal penggunaan ubat sedutan kortikosteroid daripada kaum Melayu (AOR:3.683, 95% CI:1.546-8.774). Manakala, responden dengan skor TNSS teruk (AOR:33.570, 95% CI:7.595-148.385) 34 kali lebih mematuhi pematuhan klinikal penggunaan ubat sedut kortikosteroid.

Responden yang sudah berkahwin adalah 2.6 kali lebih mematuhi pematuhan klinikal penggunaan ubat sedutan kortikosteroid (AOR:2.553, 95% CI: 1.152-5.660). **Kesimpulan:** Kajian ini menunjukkan alahan hama habuk jenis DP, tahap IgE serum yang tinggi mempengaruhi kualiti hidup pesakit melalui skor simptom hidung yang mempunyai kepatuhan tinggi kepada ubat sedutan intranasal. Kajian ini mendapati walaupun faktor pesakit memainkan peranan yang penting bagi penambahbaikan tahap pematuhan klinikal, namun kepentingan pendidikan kesihatan di fasiliti kesihatan amat penting untuk meningkatkan mutu kualiti hidup pesakit alahan hidung di negara ini.

Kata Kunci : *alahan hidung, alergi, resdung, kepatuhan ubatan, ubat sedutan kortikosteroid, hama habuk rumah*

ABSTRACT (ENGLISH)

Introduction: Allergic rhinitis (AR) is characterized by the inflammatory changes in the nasal cavity mucosa caused by inhaled allergens. The prevalence of allergic rhinitis ranges from 2.3%-7.1% among Asia-Pacific countries. Adequate medication adherence is known as taking 80% or more of the medication prescribed. **Objective:** This study was conducted to determine factors influencing the adherence to intranasal corticosteroid spray among AR patients attending the ORL clinic in a tertiary Hospital Kuala Lumpur involving 185 participants. **Method:** This was a cross-sectional study and data was collected using a self-administered questionnaire. Simple and Multiple Logistic Regression analysis was conducted to determine factors for compliance. Ethical approval was obtained from Medical Research and Ethic Committee of National Medical Research Registry (NMRR). **Results:** Response rate of this study was 93% with 185 participants. Age of participants ranged from 18 to 74 years, with females (59.5%) being the majority. Prevalence of clinical adherence to INCS among AR patients in this study was 58.9%. There was significant association between serum IgE level [$X^2(1) = 8.371, p=0.004$], DP type of dust mite [$X^2(1) = 5.149, p=0.023$], severity of total nasal symptom score (TNSS) during the first visit [$X^2(2) = 37.016, p=0.001$] and second visit [$X^2(2) = 10.304, p=0.006$]. Besides, it was found that significant risk factors for clinical adherence to INCS were participants with DP type of dust mite allergy (OR:2.13, $p<0.001$), participants who had elevated IgE (OR:2.69, $p<0.004$) and participants with severe TNSS during the first visit to ORL clinic (OR:15.13, $p<0.001$). It was found that male participants were 2.481 times more likely to be clinically adherent to INCS compared to females (AOR:2.481, 95% CI:1.140-5.397). Non-malay participants were 3.683 times more likely to be clinically adherent to INCS compared to Malays (AOR:3.683, 95% CI:1.546-8.774). Whereas, participants with severe TNSS (AOR:33.570, 95% CI:7.595-148.385) were 34 times

more likely to be clinically adherent to INCS. Married participants were 2.6 times more likely to be clinically adherent to INCS (AOR:2.553, 95% CI: 1.152-5.660). **Conclusion:** This study showed DP house dust mite, higher IgE due to allergy which affected participants quality of life which was depicted via TNSS participants adhered more to INCS. Even though patient factor also influenced adherence level, nevertheless the role of awareness and continuous patient education in the health facilities also will play an important role for the benefit of AR patients quality of life of this country.

Keywords : *allergic rhinitis, clinical adherence, intranasal corticosteroid, house dust mite*

CHAPTER 1: INTRODUCTION

1.1 INTRODUCTION

Allergic rhinitis (AR) is a worldwide health concern which is seen almost daily in a clinic by the otorhinolaryngologist. Rhinitis is defined clinically as having two or more symptoms of either anterior or posterior rhinorrhea, nasal blockage, sneezing and or itching of nose during two or more consecutive days for more than one hour on most days [1].

AR is characterized by the inflammatory changes in the nasal cavity mucosa caused by allergens inhaled. Patients respond to the allergen exposure leads to production of allergen specific immunoglobulin E (IgE) which binds to mast cell surface receptors. Receptor/IgE complex will bind to mast cell surface receptor when there is an exposure to similar allergen causing production of inflammatory mediators such as histamine, serine protease, heparin and many more. These inflammatory mediators contribute to the classical allergic rhinitis symptoms which are sneezing and itching caused by nerve irritation, rhinorrhea caused by loss of mucosal integrity and nasal block caused by vascular engorgement. Diagnosis of AR is made when patients present with rhinitis symptoms as mentioned above. Examination includes the nasal cavity examination with skin prick test (SPT) or radioallergosorbent testing (RAST). SPT is done by placing a small drop of few types of tested allergens onto the forearm and the surface of the skin is then pricked with a lancet through the drop of allergen to introduce the allergen to the immune system. If patient has allergy to the allergen, it will appear red, bumpy wheal which may be itchy, therefore indicates a positive SPT towards that particular antigen. In a RAST test, it measures the IgE antibody in the blood in response to suspected antigen.

Besides that, AR can be divided into intermittent or persistent disease and classify severity into mild, moderate and severe based on Allergic Rhinitis and its Impact on Asthma (ARIA) guidelines. In moderate to severe AR, the level of serum IgE is higher compared to in mild AR patients [2].

Prevalence of AR in an Asia-Pacific survey showed 2.3% in adult Philippines compared to 13.2% in Australia. Malaysia showed 7.1% diagnosed with AR [3]. AR is closely related to asthma which is seen in the survey conducted by Katelaris, showed that 37% of adult AR patients suffered from asthma, whereas, 19% in Malaysia. Therefore, controlling the AR symptoms will indirectly control the exacerbation of asthma in a patient [3].

Treatment for allergic rhinitis is based on ARIA guideline. Recent updated ARIA 2016 recommends treatment for moderate to severe disease rather than mild disease as usually patients with mild disease rarely seek medical treatment and usually self-treat with over-the-counter (OTC) medications [4]. ARIA and European Academy of Allergology and Clinical Immunology (EAACI) recommend intranasal corticosteroid spray (INCS) as first line treatment for moderate to severe or persistent disease as it has anti-inflammatory property to control nasal congestion, thus improve clinical symptoms [5].

Medication adherence is defined by World Health Organization (WHO) as ‘the degree to which a person’s behaviour- taking medication following a diet, and/or lifestyle changes, corresponds with agreed recommendations from a health care provider’ [6]. There are also studies done on adherence which defines adequate medication adherence as taking 80% or more of the medication prescribed [7]. There have been a few studies looking into adherence of patients especially with chronic illness such as asthma, diabetes mellitus, hypertension, allergic rhinitis or chronic obstructive pulmonary disease (COPD). A study done assessing the asthmatic patients and their adherence to treatment reported that less than half of the given medication were taken [8]. Creating awareness and understanding towards a patient’s chronic illness may improve the patient’s adherence by matching medication schedule with respect to their daily routine for example modifying the medication plan according to their working hours or based on the severity of symptoms such as in AR patients. Where by, we tailor the INCS according to

patients' severity in symptoms, such as if patient only has mild intermittent AR, the treatment can be taken as needed, therefore, a question on adherence will not arise.

A study on SPT done by Institute for Medical Research (IMR) on allergic rhinitis patients from Hospital Kuala Lumpur Otorhinolaryngology patient's noted that all patients had positive SPT to at least one allergen [9]. Common allergens tested in this study by IMR was house dust mites, *Dermatophagoides pteronyssinus* (DP) and *Dermatophagoides farina* (DF), cat and dog fur, mixed grass pollen, mixed moulds and American cockroach (*Periplaneta species*) [9].

Large number of AR patients do not consult physicians and usually self-treat by buying OTC drugs. Two third of patients were reported to buy OTC non-prescribed medication for AR [10].

A recent study done among 695 office workers in an institution in Klang Valley, Malaysia, noted that 52.5% of workers who joined this study were allergic to house dust mite followed by cat allergy of 25.4% [11]. Patients suffering from AR have a significant negative impact on quality of life as nasal congestion may contribute to sleep disturbance such as difficulty in falling asleep and night time awakening. Also affecting social life as patients with moderate to severe disease will constantly need to have a tissue in their hands and persistent sneezing may reduce their self-confidence and affect their social status. Whereas the nasal congestion affects their work and studies as they have inability to focus and concentrate, leading to tiredness which reduces productivity. This indirectly reduces the nation productivity.

In Hospital Kuala Lumpur, ARIA guidelines are used to classify and manage AR patients. Pharmacological treatment based on ARIA recommends oral anti-histamine with or without INCS. There are many types of INCS such as budesonide, mometasone furoate, fluticasone furoate, azelastine nasal spray and many more in the market. In my centre, the commonest nasal spray prescribed are budesonide, mometasone furoate and fluticasone furoate. However, many studies done on INCS noted that non-compliance to INCS was due to lack of

patient education, knowledge and awareness of the benefits of INCS [10]. Many patients have a misunderstanding that by using INCS the effect of the medication will reduce if used for a long time, some are afraid of the side effects of steroid content in the nasal spray. Therefore, it is the responsibility of the healthcare provider to educate the patients on their disease and the need to use INCS long term to see benefits. Proper technique should also be emphasized as many side effects such as aftertaste and post nasal drip after using the spray is commonly due to improper technique of spray.

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CHAPTER 2: OBJECTIVES OF THE STUDY

2.0 OBJECTIVES OF THE STUDY

2.1 General Objective

To study the adherence to intranasal corticosteroid spray in treatment of allergic rhinitis patients.

2.2 Specific Objectives

1. To determine factors influencing the adherence to treatment.
2. To look for allergens contributing to illness by performing an allergic test for all the patients.

CHAPTER 3: MANUSCRIPT

3.1 TITLE PAGE

Factors affecting adherence of intranasal corticosteroids in allergic rhinitis patients with comorbid medical conditions

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3.2 ABSTRACT

Background: This study was conducted to determine factors influencing the adherence to intranasal corticosteroid spray among allergic rhinitis (AR) patients with or without comorbid medical conditions attending the ORL clinic in a tertiary Hospital Kuala Lumpur involving 185 participants.

Method: It was a descriptive observational study with simple convenient sampling method. Data were collected using a self-administered questionnaire, whereby sociodemographic data, medical history and clinical adherence of respondents were measured. Data analysis was done using IBM (SPSS) version 25.

Results: The prevalence of medication adherence was 58.9%. It was found that respondents with *Dermatophagoides pteronyssinus* (DP) type dust mite allergy were twice more likely to be adherent to intranasal corticosteroid spray (INCS) compared to respondents without the DP allergy (OR:2.13, 95% CI:1.10-4.11, $p = 0.001$). Participants who had elevated immunoglobulin E (IgE) were 2.7 times more likely to be adherent to INCS compared to participants with normal IgE levels (OR:2.69, 95% CI: 1.36-5.34, $p = 0.004$). Besides that, severe total nasal symptom score (TNSS) during the first visit to ORL clinic had 15 times more likely to adhere to INCS compared to mild severity of TNSS (OR:15.13, 95% CI: 5.69-40.22, $p = 0.001$).

Conclusion: The medication adherence to INCS among AR participants in this study was 58.9%. Both the house dust mites specifically the DP type and severity of AR significantly affects the adherence to INCS. Sensitization to DP, severe TNSS and higher serum IgE levels are identified as factors that improved the adherence to treatment. The barriers to adherence include untroublesome symptoms, the practice of taking INCS only on having bad symptoms, fear of adverse effects, run out of medications and ineffective response to treatment.

Keywords: allergic rhinitis, medication adherence, intranasal corticosteroid, sociodemography, house dust mites

3.3 INTRODUCTION

Intranasal corticosteroids (INCS) are the recommended first line pharmacotherapy in moderate to severe allergic rhinitis (AR) due to its efficacy and effectiveness in controlling inflammation and curbing the symptoms of AR particularly nasal congestion [1,2]. The negative impact on the quality of life of patients with uncontrolled AR is well recognized. Nasal obstruction contributes to sleeping disturbances leading to tiredness and cognitive impairments such as poor focus and attention span. Moreover, persistent sneezing and rhinorrhea give rise to the need of keeping tissue paper always at hand which can reduce their self-esteem and may affect their social standing.

Medication adherence is defined as ‘the degree to which a person’s behaviour- taking medication following a diet, and/or lifestyle changes, corresponds with agreed recommendations from a health care provider’ while sufficient adherence as taking 80% or more of the medication prescribed [3,4]. Adherence to medications play a main role in accomplishing good outcomes in chronic airway conditions such as bronchial asthma, AR and chronic obstructive pulmonary disease. It has been reported that adherence to treatment in asthmatic patients was insufficient where less than half of medications prescribed was taken [5].

Due to the efficacy and safety of INCS, they are recommended as one of the main treatments in AR but the non-adherence contributes to an inadequate and unsatisfactory control. Doubt over their effectiveness and concerns of adverse effects have been brought up as reasons for the non-compliance [6]. In addition, disruption of daily activities by the medication plan was implied.

In real world practice, patients not only have allergic conditions but also other comorbid medical conditions, which could influence their adherence to treatment. These issues and others must be investigated further, in order for adherence to be improved by personalization of the treatment plan of AR. The purpose of this study was to investigate the factors influencing the usage and adherence of INCS in the treatment of AR patients.

3.4 MATERIAL AND METHODS

Study population

The inclusion criteria were all AR patients with persistent symptoms according to ARIA [1], above 18 years' old who attended the Otorhinolaryngology clinic at a tertiary hospital. In addition, patients having comorbid, physician-diagnosed chronic medical conditions like asthma, diabetes mellitus and hypertension were also included. Patients with comorbid conditions must be on medications prescribed by physicians for at least one year. Patients with underlying sinusitis, nasal polyposis, severe septal deviation causing persistent nasal obstruction, sinonasal malignancy, recent nasal surgery (less than 5 years), treatment by other medical or traditional modality and pregnancy were excluded.

Study design

A prospective study was conducted from January 2020 until June 2021. The study protocol was approved by the National Medical Research Registry (NMRR) [NMRR-19-3955-52224]. The sociodemographic information, medical and allergy history were collected. Included in the sociodemographic characteristics were marital status, number of children and pets kept at home. The level of education was based on the International Standard Classification of Education (ISCED) and divided into primary, secondary and tertiary education [7]. The occupation was classified according to professional or non-professional together with the duration of working hours. Professional occupation was defined as a job that requires a Bachelor, Master or Doctor of Philosophy (PhD) degree [8]. Examination was performed with nasoendoscopy examination and allergy status was confirmed by skin prick or serum specific IgE test. Patients were given a drug diary/journal to establish their compliance and record any adverse effects such as nasal dryness or discomfort while undergoing treatment.

Assessment of symptoms

The total nasal symptom score (TNSS) was assessed to ascertain the severity of symptoms. TNSS comprises of the sum of score for nasal congestion, sneezing, nasal itching and rhinorrhea with each using 4 points scale of 0 to 3. 0 indicates no symptoms, score of 1 indicates mild symptoms, 2 for bothersome symptoms but tolerable and 3 being severe symptoms that are hard to tolerate and interferes with daily activities. The first assessment was carried out at the first visit and subsequently at fourth- and twelve-weeks following enrollment. The total serum IgE level at the first visit was documented. All patients were given INCS and were counselled on the dosing and proper technique of application. During follow up visits, the compliance was assessed in addition to the severity of symptoms, findings on examination and technique of using nasal spray.

Assessment of adherence

Adherence to medication was based on the diary given to the patients by calculating the number of days' patients used the nasal spray (total number of days use of medication / prescription period $\times 100$). Adherence was defined as taking 80% or more of the prescribed medication [4]. The level of adherence was also measured by the Brief Medication Questionnaire (BMQ) at 12th week. BMQ provides a flexible method of screening non-adherence in patients with diverse drugs, drug regimens and the barriers to adherence [9]. BMQ comprises of 3 domains namely Regimen, Belief and Recall. Each domain has their own questions with score. It can be classified into high adherence or low adherence [10]. When the score was 0 in all domains or positive for one, it was classified as high adherence, while positive in 2 or more domains classified as low adherence.

Statistical analysis

Data were analyzed using IBM Statistical Package for Social Science (SPSS) version 25. Descriptive statistics was used to describe characteristics of respondents. Categorical variables were analyzed and frequencies were obtained and tabulated. The data obtained were expressed

as mean $\pm$ SD for numerical and frequency (%) for categorical variables. Bivariate analysis of Chi square test was used to measure associations between categorical variables and medication adherence. $P < .05$ was considered to be statistically significant.

3.5 RESULTS

Characteristics of study participants

185 participants were enrolled. Age of participants ranged from 18 years old to 74 years old, with a mean of 37.9 ± 14.8 years. Most of the participants were under the age group of 18 to 39 years (63.8%), followed by 40 to 59 years (24.9%) and 60 years and above (11.4%). Female participants consist of 59.5%, while males were 40.5%. The other demographic characteristics are shown in Table 1. 55.7% of participants had tertiary followed by secondary (42.7%) and 1.6% primary education. The type of occupation and working hours are shown in Table 2. 69.7% of participants had history of allergy to either food or aeroallergen such as dust mites. Only 31.4% had positive family history of allergy. The sensitization to allergens and level of IgE are shown in Table 3. 23.8% of participants had concomitant bronchial asthma or eczema with 18.9% bronchial asthma and 9.2% had eczema. The comorbid medical conditions are shown in Table 4. It also includes patients who has other comorbid medical conditions such as DM, HPT, eczema and bronchial asthma taking multiple medications.

Table 1. The characteristics of participants.

Parameters	Frequency (n)	Percentages (%)	<i>p</i>
Age			0.716
18-39	118	63.8	
40-59	46	24.9	
≥60	21	11.4	
Gender			0.09
Male	75	40.5	
Female	110	59.5	
Race			0.248
Malay	134	72.4	
Chinese	20	10.8	
Indian	29	15.7	
Others	2	1.1	
Marital Status			0.098
Single	70	37.8	
Married	112	60.5	
Divorce	3	1.6	
Number of Children			0.784
No children	77	41.6	
2 or less	62	33.5	
More than 2	46	24.9	
Pets			0.772
No	128	69.2	
Yes	57	30.8	

Table 2. The level of education, occupation and working hours.

Parameters	Frequency (n)	Percentages (%)	<i>p</i>
Education level			0.056
Primary	3	1.6	
Secondary	79	42.7	
Tertiary	103	55.7	
Occupation			0.198
Professional	72	38.9	
Non-professional	113	61.1	
Working hours			0.848
≤42hrs	115	62.2	
>42hrs	70	37.8	

Table 3. Atopic status, sensitization to allergens and serum IgE level

Parameters	Frequency (n)	Percentage (%)	<i>p</i>
Known allergy			0.819
No	56	30.3	
Yes	129	69.7	
Family history			0.260
No	127	68.6	
Yes	58	31.4	
Dust mite			0.214
None	34	18.4	
Present	151	81.6	
Type of dust mite			
DP			0.023
Present	135	73.0	
Absent	50	27.0	
DF			0.352
Present	94	50.8	
Absent	91	49.2	
Cockroach			0.348
Absent	126	68.1	
Present	59	31.9	
Cat dander			0.242
Absent	145	78.4	
Present	40	21.6	
Seafood			0.272
Absent	102	55.1	
Present	83	44.9	
IgE level			0.004
Normal	46	24.9	
Elevated	139	75.1	

Table 4. Comorbid medical conditions.

Parameters	Frequency (n)	Percentages (%)	p
Bronchial asthma			0.223
No	150	81.1	
Yes	35	18.9	
Eczema			0.566
No	168	90.8	
Yes	17	9.2	
Bronchial asthma and eczema			0.518
No	141	76.2	
Yes	44	23.8	
Diabetes mellitus (DM)			0.181
No	169	91.4	
Yes	16	8.6	
Hypertension (HPT)			0.617
No	163	88.1	
Yes	22	11.9	
DM and HPT			0.384
No	158	85.4	
Yes	27	14.6	
Multi drug			0.311
No (1-3)	172	93%	
Yes (>3)	13	7%	

Use of INCS

Table 5 shows the severity of TNSS during the first, second and third visit. The medication adherence to INCS was 59.5%. Among the reasons for missing the prescribed doses was that symptoms were not bothering them, and they resume taking medication on needed basis when symptoms such as nose block and rhinorrhea relapse. Other documented reason was forgetfulness, being occupied with work or studies or house chores in the case of house wives. Worsening of symptoms, after taste and dizziness after using the nasal spray were also disclosed as the pretext for non-adherent regardless of the type of nasal spray. These effects are commonly seen due to spray technique and the type of INCS [11]. Fear of drug interaction was quoted by a small number of patients, for example when they were unwell and need to take other medication,

INCS was discontinued to avoid such occurrence. Table 6 shows the barriers to adherence. The domains of BMQ highlighted various causes of the barriers to adherence. Regimen domain showed non-bothering symptoms and usage of INCS only when symptoms are troublesome. In belief screen participants were more concern of the side effects of the drugs and drug interaction to their existing medication for other comorbidities. Meanwhile for recall screen, participants were found to forget to use their INCS due to busy schedule. However, we encountered one participant who was diagnosed to have cancer almost at the end of this study which affected the adherence as she had too many supplements to take and forgets to take the INCS.

Table 5. Severity of TNSS

Severity of TNSS	Frequency (n)	Percentage (%)	<i>p</i>
First visit			0.000
Mild	57	30.8	
Moderate	76	41.1	
Severe	52	28.1	
Second visit			0.006
Mild	102	55.1	
Moderate	73	39.5	
Severe	10	5.4	
Third visit			0.085
Mild	137	74.1	
Moderate	73	24.3	
Severe	10	1.6	

Table 6. Barriers to adherence.

Regimen domain	Frequency (n)
Symptoms not bothering	57
Run out of medication supply	5
Afraid of side effect	4
Uses when symptoms are bad	19
Ineffective	1
Belief domain	Frequency (n)
Side effect	
-sneezing	1
-nasal congestion	2
-dizziness	1
-after taste	2
Drug interaction	3
Recall domain	Frequency (n)
Taking too many medications	1
Busy schedule	17

Adherence to INCS

Table 1 shows the association between sociodemographic factors and medication adherence to INCS. No statistically significant association seen between medication adherence and age ($\chi^2 = 0.67$ df = 2, $p > 0.05$), gender ($\chi^2 = 2.72$ df = 1, $p > 0.05$), marital status ($\chi^2 = 4.64$ df = 2, $p > 0.05$), number of children ($\chi^2 = 0.488$ df = 2, $p > 0.05$) and keeping pets at home ($\chi^2 = 0.084$ df = 1, $p > 0.05$). No significant association was seen between medication adherence and known allergy ($\chi^2 = 0.052$ df = 1, $p > 0.05$), family history of allergy ($\chi^2 = 1.27$ df = 1, $p > 0.05$), asthma and eczema ($\chi^2 = 0.418$ df = 1, $p > 0.05$) and medical conditions ($\chi^2 = 0.759$ df = 1, $p > 0.05$).

Higher prevalence in adherence was seen in participants who were professionals (65.3%) and participants with tertiary education (64.15%). However, no significant association was observed between medication adherence and level of education ($\chi^2 = 5.76$ df = 2, $p > 0.05$), occupation ($\chi^2 = 2.46$ df = 1, $p > 0.05$) and working hours ($\chi^2 = 0.037$ df = 1, $p > 0.05$).

Medication adherence was greater in participants having elevated serum IgE (65.5%) with significant difference ($\chi^2 = 8.371$ df = 1, $p < 0.05$) seen compared to normal serum IgE. Dermatophagoides farina (DP) house dust mite (HDM) was the commonest allergens (64.4%) among the participants and played a significant role in medication adherence ($\chi^2 = 5.149$ df = 1, $p < 0.05$). Despite the increased prevalence in medication adherence in participants with seafood allergy, cockroach allergy and cat dander allergy, the association is not significant.

There was no significant difference ($\chi^2 = 4.122$ df = 2, $p > 0.05$) in the medication adherence among participants on fluticasone furoate, mometasone and budesonide nasal sprays. The severity of TNSS has a significant association in medication adherence during the 1st ($\chi^2 = 37.016$ df = 2, $p < 0.05$) and 2nd visit ($\chi^2 = 10.304$ df = 2, $p < 0.05$) but no difference was found at the 3rd visit (Table 6). The level of adherence using BMQ revealed 89.2% high adherent and 10.8% low adherent (Table 7) with participants scoring 56.2% for Regimen, 4.9% for Belief and 14.6% for Recall screen. In BMQ, only the Regimen domain affected the medication adherence ($\chi^2 = 98.24$ df = 1, $p < 0.05$).

Table 7. The level of adherence to intranasal corticosteroids.

Parameters	Frequency (n)	Percentages (%)	p
BMQ			
Regimen screen			0.000
No	81	43.8	
Yes	104	56.2	
Belief screen			0.102
No	176	95.1	
Yes	9	4.9	
Recall screen			0.384
No	158	85.4	
Yes	27	14.6	

Posthoc analysis

A repeated measure ANOVA analysis was used to determine the severity of TNSS during the three visits (Table 8). A post hoc pairwise significant difference was seen among the TNSS from the initial first appointment to the second visit (6.81 to 5.16, $p < 0.0001$) and subsequently from first appointment to the third visit (6.81 to 4.07, $p < 0.0001$). A simple logistic regression analysis found that participants with house dust mite allergy (type DP) were twice more likely to be adherent to INCS than participants without the DP allergy (OR:2.13, 95%CI:1.10-4.11). Participants who had elevated IgE were 2.7 times more likely to be adherent to INCS compared to normal IgE (OR :2.69, 95% CI : 1.36 – 5.34). Severe TNSS during the first visit to the ORL clinic had 15 times more likely to be adherent to INCS compared to mild TNSS (OR :15.13 95% CI : 5.69– 40.22). Participants with moderate TNSS at the first visit had 4 times more likely to be adherent to INCS compared to mild TNSS (OR :4.03 95% CI : 1.94– 8.41).

Table 8. Posthoc analysis of factors affecting clinical adherence to INCS.

Factors	B	S.E.	Wald	Crude OR	95% Confidence Interval		P value
					Lower	Upper	
House Dust Mite Type DP							
Present	0.755	0.336	5.052	2.13	1.101	4.11	0.001*
Absent				1			
IgE level							
IgE Elevated	0.991	0.349	8.08	2.69	1.36	5.34	0.004*
IgE not Elevated				1			
Severity of TNSS in first visit during ENT Clinic follow up							
Mild				1			0.001*
Moderate	1.395	0.375	13.86	4.03	1.935	8.406	
Severe	2.716	0.499	19.65	15.13	5.689	40.215	

3.6 DISCUSSION

Prevalence of AR affects large population throughout the world including Asia, ranging from 27% in south Korea to 32% in United Arab Emirates. Prevalence of adherence to INCS among AR patients in this study was 59.5%, comparatively lower than a study done in Italy which was 85.7% and almost the same as a study done in Singapore (63.1%) [11, 12]. The adherence rate found in neighbouring countries in Southeast region showed lower trend compared to European countries that has higher adherence rate of more than 80%.

Our study included 185 AR participants with median age of 35 years old with age ranging from 18 to 74 years old. Prevalence of medication adherence was lower among the middle age group (40 to 59 years old) in this study. In a study conducted by Malin Alexsson et al, it was seen that younger generation (mean age of this study was men=50.3 and females=48) were more prone to non-adherence due to personality traits such as being impatient or lack of discipline [13]. Predominantly there were more female (59.5%) participants compared to male but the prevalence of adherence to INCS was seen more among male participants (66.7%). However, this was not statistically significant as seen in a similar study done by Kuiji Wang et al where there was no significant association between gender and adherence [14]. However, adherence is affected by personality traits of an individual, which accounts for more adherence among the female and older age group patients [13].

Most of the participants were married (60.5%) corresponding to the study done by Emre Ocak et al [15] which showed no significant relationship between marital status and adherence to INCS. However, married participants showed higher prevalence to adherence to INCS by 61.6% followed by single (58.6%) and divorced (0%). Participants with less than or 2 children were more prevalent to clinical adherence compared to participants with no children or more than 2 children. The burden of responsibility and more time required to care for additional number of children could be contributing factors to account for the participants neglecting their medication.