# The Sensitivity and Specificity of Score for Allergic Rhinitis (SFAR) Questionnaire as a Diagnostic Tool for Allergic Rhinitis in H. Adam Malik General Hospital, Medan

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**Abstract : Background:** The Skin Prick Test (SPT) is the gold standard for diagnosing allergic rhinitis (AR), however, its availability is still limited hence the need of the alternative options which are simple, fast, cost-effective, easy-handled by general practitioners, and have a low rejection rate for AR are required. Score For Allergic Rhinitis (SFAR) is a questionnaire that has been used in several studies for the identification of AR.

**Aim:** To evaluate the sensitivity and specificity of the SFAR questionnaire for diagnosing AR.

**Method:** This was across-sectional study conducted in the ENT-HN outclinic of H. Adam Malik General Hospital, Medan with a sample size of 42 patients. The study performed the anamnesis, physical examination, the SFAR questionnaire test, and SPT. The diagnosis of ARwas made if the SFAR score was ≥ 7 and a score of <7 was defined as not AR.

**Results:** Among the 42 patients, the SFAR ≥ 7 and positive skin prick test was found in 38 patients (90.5%). The sensitivity of the SFAR questionnaire was 97% and the specificity was 33% with a positive predictive value of 95% and a negative predictive value of 50%.

**Keywords :** Allergic Rhinitis, Skin Prick Test, Score For Allergic Rhinitis.

## Introduction

Allergic rhinitis is still a global health concern with a prevalence of 10%-40% and tend to increase[1]. The prevalence of allergic rhinitis is varied between countries. In the United States, for instance, the prevalence of allergic rhinitis is around 8.8%-16%[2]. In Belgium, the prevalence of allergic rhinitis is around 28.5%, France 24.5%, Italy 16.9%, United Kingdom 26%, Spain 21.5%[3]. Meanwhile, its prevalence in Japan is 35.5% and in Philippines is 20%[4.5]. On the contrary, the prevalence in Indonesia still not known, but various data from hospitals showed that its frequency ranging from 10-26%.[6]

The diagnosis of allergic rhinitis is made based on history, physical examination, and additional examination. The Skin Prick Test is still the main diagnostic tool and it is recommended to identify the immediate allergic reactions because there is a high correlation with the level of symptoms. This test is fast,

simple, and uses various allergens at the same time. The results could also be read within 15 minutes after exposure and are well-tolerated by patients.[7]Unfortunately, this test is expensive, so it might not be available in all health centers, particularly in developing countriy such as Indonesia.

In order to overcome this problem, some validated questionnaires have been developed and tested in several countries such as France and 6 African countries.[1] The Score For Allergic Rhinitis questionnaire is a set of questions for patient with allergic rhinitis. The Score For Allergic Rhinitis has been used in many studies and has been shown to have a good sensitivity. By using the Score For Allergic Rhinitis, a study in Turkey found the prevalence of AR to be 29.6%.[8] The sensitivity of SFAR in some countries such as Morocco and Syria was 82%, and Tunisia was 90%.[1]

The Score for Allergic Rhinitis is could be used as a standard screening instrument. The SFAR allows the identification of allergic rhinitis in rural areas, due to its cost-effectiveness. Other advantages of SFAR are quick, easy to use for anyone, have low rejection rate, and well-distributed for non-specialist clinical practitioners.[1]

By the author's knowledge, the use of SFAR for diagnosing allergic rhinitis in Indonesia have not been done. This study aim to evaluate the sensitivity and specificity of SFAR compared to the gold standard for diagnosing allergic rhinitis, the Skin Prick Test.

## Method

This was a descriptive, cross-sectional study conducted in Rhinology/Allergic-ImmunologyENT-HN outclinicof H. Adam Malik General Hospital, Medan. The patients was interviewed and physical examination was performed. The diagnosis was made using Skin Prick Test. All patients who came later were given an SFAR questionnaire.

According to Zaidi, et. al. (2016), the sample size was calculated using a formula of:

$$n = \frac{Z^2 \times Sn(1-Sn)}{d^2 \times p}$$

$$n = \frac{(1.64)^2 \times 74\%(100-74\%)}{(20\%)^2 \times 30\%}$$

$$n = \frac{2.68 \times 0.74(0.26)}{(0.2)^2 \times 0.30}$$

**n** = 42 samples

Where:

| | |
|---|---|
| n | = sample size |
| Z | = standard deviation of normal distribution of 90% (z = 1.64) |
| P | = the proportion of allergic rhinitis patients of 30% |
| d | = tolerated sampling error (defined by 20 percent or 0.20) |
| Sn | = the SFAR sensitivity of previous study (Annesi-Maessano et. al. 2002) of 74%. |

The inclusion criteria were patients aged $\geq$ 17 years, not on antihistamine regimen in the past 1 week, not exhibit any extensive skin disease, especially in the volar forearm, and were willing to take part in the study. This study was approved by Faculty of Medicine, University of Sumatera Utara.

The Skin Prick Test used in this study was the Stallergen brand. SPT is an allergen-extract tool for diagnosing allergies against inserted allergens in the volar part of the forearm to determine whether there is an allergic reactions mediated by IgE by assessing the resulting bump. This assessment used the resulting bump after 15 minutes of allergens exposure. The Skin Prick Test results were defined as positive if the bump diameter was at least 3-mm or equal to or greater than positive control.

The SFAR questionnaire consisted of 8 questions: (1) nasal symptoms in the last 12 months, such as sneezing, runny nose, and nasal congestion; (2) nasal symptoms accompanied by itchy/runny eyes (rhinoconjunctivitis); (3) in what month or season did the nasal symptoms occur; (4) the trigger factors of nasal symptoms such as house dust, pollen, etc; (5) the self-awareness of allergic status; (6) previous positive allergy testing; (7) previous medical diagnosis of allergic diseases (asthma, skin allergies, allergic rhinitis); (8) family history of allergy. Each question was given a score between 1-2 with a maximum total score of 16.

The sensitivity and specificity were calculatedagainst SPT using 2x2 tables. The sensitivity was true positives/(true positive + false negatives), specificity was true negative/(true negatives + false positives), positive predictive value (PPV) was true positives/(true positives + false positives), negative predictive value (NPV) was true negatives/(true negatives + false negatives).

## Results

**Table 1. The Distribution of Frequency of Patients with Allergic Rhinitis, according to Age, Gender, Duration of Symptoms**

| Characteristics | Total(%) |
|---|---|
| • Age<br><20<br>21-35<br>36-50<br>>50 | 3(7,1)<br>32(76,2)<br>5(11,9)<br>2(4,8) |
| <mean ( < 29,21)<br>≥ mean ( ≥ 29,21) | 28(66,7)<br>14(33,3) |
| • Gender<br>Male<br>Female | 7(16,7)<br>35(83,3) |
| • Duration of Symptoms<br>< 4 days/weeksor> 4 weeks<br>> 4 days/weeksand > 4 weeks | 16(38,1)<br>26(61,9) |

In table 1, it can be seen that the highest age group was the 21-35 years old with 32 (76.2%) subjects and the least age group was the >50 years old with 2 (4.8%) subjects. Using the averation, 28 (66.7%) subjects were below the average, while the above average was 14 (33.3%) subjects. The majority of gender were female at 35 (83.3%) subjects. The most frequent symptoms were lasted for >4 days/weeks and> 4 weeks at 26 (61.9%) subjects while the <4 days/ week or> 4 weeks group was only 16 (38.1%) subjects.

**Table 2. The Distribution of Frequency of SFAR Questionnaire Answers from Allergic Rhinitis Patients**

| Patient answers | Yes(%) | No(%) | Total |
|---|---|---|---|
| • Symptoms<br>Nasal congestion<br>Runny nose<br>Sneezing<br>Itchy and watery eyes | <br>38(90,5)<br>39(92,9)<br>39(92,9)<br>31(73,8) | <br>4(9,5)<br>3(7,1)<br>3(7,1)<br>11(26,2) | <br>42 (100%)<br>42 (100%)<br>42( 100%)<br>42(100%) |
| • Time/Season<br>Some months<br>All years<br>Winter<br>Summer<br>Fall<br>Spring | <br>20(47,6)<br>22(52,4)<br>30(71,4)<br>0<br>0<br>0 | <br>22(52,4)<br>20(47,6)<br>12(28,6)<br>42 (100%)<br>42 (100%)<br>42 (100%) | <br>42 (100%)<br>42 (100%)<br>42 (100%)<br>42 (100%)<br>42 (100%)<br>42 (100%) |

| | | | |
|---|---|---|---|
| • Trigger factors | | | |
| House dust | 41(97,6) | 1(2,4) | 42(100%) |
| House dust mite | 24(57,1) | 18(42,9) | 42(100%) |
| Pollen | 3(7,1) | 39(92,9) | 42(100%) |
| Animal (cat, dog) | 12(28,6) | 30(71,4) | 42(100%) |
| | | | |
| • Allergic test | | | |
| Assumed allergy | 39(92,9) | 3(7,1) | 42(100%) |
| Previous allergy test | | 27(64,3) | 42(100%) |
| Positive | 15(35,7) | | |
| Negative | 0 | | |
| | | | |
| • History of allergy | 31(73,8) | 11(26,2) | 42(100%) |
| | | | |
| • Family history | | 9 (21,4) | |
| Father | 10 (23,8) | | |
| Mother | 15 (35,7) | | |
| Siblings | 24 (57,1) | | |

Table 2 shows the distribution of patient's answers using the SFAR questionnaire. The most frequent symptoms were nasal congestion, runny nose and sneezing, which was complained in 90.5% of patients, 92.9% of patients and 92.9% of patients, respectively. The majority of patients complained that the symptoms appeared during winter (71.4%). The most common triggers complained by patients were house dust by 97.6% of all triggers. The next complained was by house dust mites (57.1%). A total of 39 people (92.9%) thought they have positive allergic status. In accordance with the patient's statement, 73.8% had a history of allergies, and 57.1% admitted a family history of allergies in their siblings.

**Table 3. The Distribution of Frequency of Allergent Types Based on The Skin Prick Test Results**

| Allergen types | Total (%) |
|---|---|
| Grass bermuda | 7 (7,69) |
| Tropicalis blomia | 20 (21,98) |
| Cockroach B. Germanic | 10 (10,99) |
| D. pteronyssinus | 22(24,17) |
| D. farinae | 21(23,08) |
| Cat | 6 (6,59) |
| Dog | 5 (5,49) |

Table 3 shows that patients with skin prick tests with the most frequent types of allergens were D. pteronyssinus with 22 (24.17%) subjects, followed with D. farinae with 21 (23.08%) subjects, and Tropicalis blomia with 20 people (21.98%) subjects.

**Table 4. The Comparison of SFAR Questionnaire with Skin Prick Test Results**

| SFAR Questionnaire | Skin Prick Test | | Total |
|---|---|---|---|
| | + | - | |
| ≥7 | 38 | 2 | 40 |
| < 7 | 1 | 1 | 2 |
| **Total** | 39 | 3 | 42 |

Sensitivity : 97%,    Specificity: 33%,   PPV: 95 %,   NPV: 50%

In table 4, it could be seen that patients with SFAR ≥7 were as many as 40 subjects while those with <7 were only 2 subjects.Based on the the skin prick test, the patientswith SFAR ≥7 and positive skin prick test were as many as 38 subjects while the those with SFAR ≥7 and negative skin prick test were only 2 subjects.On the other hand, the patient with SFAR <7 and positive skin prick test was only found in 1 subject and the those with SFAR <7 and negative skin prick test was also only found in 1 subject. Table 4 also shows that the sensitivity of the SFAR questionnaire was 97% which meansthe SFAR questionnaire may detect 97% of screened patients with allergic rhinitis. Meanwhile, the specificity of the SFAR questionnaire was 33%, which means that the SFAR questionnaire may detect 33% of screened patients without allergic rhinitis when compared to the skin prick test. A positive predictive value of 95% indicates that the probability of patients diagnosed with allergic rhinitis by the SFAR questionnaire would be 95% positive when compared to the skin prick test. Meanwhile, a negative predictive value of 50% indicates that the possibility of the patients without allergic rhinitis would be negative in 50% subjects compared to the skin prick test.

## Discussion

Allergic rhinitis is an inflammatoric disease of the nasal mucosa caused by an allergic reaction in the patient who has been previously sensitized with the same allergen and will release the chemical mediators if re-exposed to them.[9]

In this study, the allergic rhinitis was most frequent in the age group of 21-35 years old with 32 (76.2%) cases. This was consistent with the study by Reinhard, Palandeng, Pelealu (2013). In their study, the most frequent age group with allergic rhinitis was the 21-30 years old with 50 (23.92%) cases.[10]While on the study by Denny Satria Utama (2010), the most frequent was the 18-35 years old (44.6%), <18 years old (28.4%), 36–50 years old (24.3%), and>50 years old (2.7%).[11]The result of study conducted by Rahmawati, Suprihati, Muyassaroh (2011) found that 68 patients with persistent allergic rhinitis has an average age of 27.8±11.7 years, while the youngestwas 11 years old and the oldest was 54 years old, the most frequent age group was 23-34 years old (38.2%).[12] A panel experts stated that the peak prevalence of allergic rhinitis occurs in the post-pubertal period and gradually decreases in middle age and older.[13]

The most frequent gender affected by allergic rhinitis was female (83.3%) which in accordance to Rahmawati, Suprihati, Muyassaroh (2011), which stated that women (67.6%) were more frequent than men (32.4%)[12.] Similar finding was also found from the study by Lumbanraja PLH (2007) which found that the most affected gender was women with 54 (87.1%) and 8 men (12.9%) out of 62 total cases.[14] In addition, a study conducted by Denny Satria Utama (2010) also found that female had a slightly more tendency to allergic rhinitis, which was 54.1% compared to 45.9% in male. The study conducted by Syamsiyah S at Arifin Achmad General Hospital, Pekanbaru on 221 cases of allergic rhinitis also found that allergic rhinitis was found more in women (57.92%) than in men (42.08%).[9,11]

From this study, it was found that the most frequent symptoms complained within >4 days/weeks and>4 weeks (persistent) with 61.9%. This is consistent with the results of a study by Bousquet et al (2005) where 10% of patients had intermittent mild rhinitis, 14% had mild persistent rhinitis, 17% had moderate/severe intermittent rhinitis, and 59% had moderate/severe persistent rhinitis. Intermittent and persistent rhinitis did not associated with seasonal and annual rhinitis.[15]

Table 2 shows that the most complained symptoms were runny nose and sneezing. The results of this study are similar to the study conducted in the Allergy-Immunology Subdivision of Department of ENT of FKUI/RSCM where the most frequent symptoms was sneezing with 89.80%, rhinore with 87.07%, and nasal congestion with 76.19%.[9] In accordance with the results of the study by Reinhard, Palandeng, Pelealu (2013) which was obtained from patients in the ENT-HN outclinic of Prof. Dr. R. D. Kandou General Rospital, Manado, the most frequent symptoms was sneezing with 119 patients (39.40%), rhinore with 108 patients (35.76%), nasal congestion with 75 patients (24.83%).[10] The results of this study showed that allergic rhinitis patients accompanied with watery eye (rhinoconjunctivitis) with 73.8%, which is in accordance to the study of Ologe et al (2013) which stated that rhinoconjunctivitis occurred in 75 patients with allergic rhinitis (92.6%).[16] Watery nose, sneezing, nasal congestion with lacrimation, and itchy nasal mucosa, conjunctiva and oropharynx are the classic features of allergic rhinitis.

The results of this study showed that patients who experienced all-year allergic rhinitis were 52.4%. This is in accordance with the study of Bauchan and Durham (2004) that in all of studied countries, they found 209 perennial allergic rhinitis patients.[3]

The results of the study showed that the most frequent trigger factor for allergic rhinitis was house dust in 97.6%. This is in accordance with the study of Lopo C (2003) in Makassar which reported that the most positive types of allergens from skin prick test was house dust (77.27%) and house dust mites (54.55%). House dust, for some groups of people, is an important component of inhalant allergens because it plays a role in the emergence of allergic reactions. The house dust mites is found among the house dust itself. These house dust mites are found in damp houses, mattresses, pillows, bolsters, carpets and various other home furnishings. The largest population of house dust mites is found in bedroom, especially in mattress.

The finding of this study showed that 92.9% of patients assumed themselves to suffer from allergic rhinitis and 64.3% of patients had never taken any allergic examination. This is in accordance with the study of Ologe et al (2013) which found that 96.3% of patients assumed themselves to suffer from allergies, but in those study, all patients had never taken any allergicexamination.[16]

This study also found that the patients who had a history of allergies were as many as 31 subjects (73.8%). This is slightly different from the study of Ologe et al (2013) which found that the patients who had a history of allergies were 66 subjects (81.5%). Even though allergic rhinitis is usually not severe, this condition still remains a global public health concernwith a prevalence of 10% to 40% and tend to increase.[1,16]

The results show that the patients with a family history of allergies were 78.6%. This is in accordance with the study of Ologe et al (2013) which found 65 patients has a family history of allergies in 80.2%. Genetic factors play a role in atopic disease. The genetic component inherited to the child is the capability to react to particularinherited allergens.[1,16]

From the table 3, this study shows that the patients with skin prick test with the highest type of allergen was D. pteronyssinus with 22 subjects (24.17%), followed with D. fariane with 21 subjects (23.08%) and Tropicalis blomia with 20 subjects (21.98%). This is consistent with the study of Alimah Y (2005) which reported that the most positive types of inhalant allergens was house dust (60%) and house dust mites (75%). In the allergy-immunology outclinic of Department of ENTof Dr. Wahidin Sudirohusodo Hospital, Makassar for 2 years (2005-2006) showed that the most freqeutn inhalant allergens was house dust mites (75.6%) followed by house dust (42.1%).[17]

In this study, the patients diagnosed with allergic rhinitis based on the results of the SFAR questionnaire and positive skin prick test were found in of 38 (90.5%) cases. The results of this study are higher than the Annesi-Maesano et al (2002) where their study found 89 from 146 patients (61%) had positive SFAR questionnaire and skin prick test.[18]

From current study, it can be concluded that the sensitivity and specificity of the SFAR questionnaire against the skin prick test in diagnosing allergic rhinitis was 97% and 33%, respectively, while the positive predictive value was 95% and the negative predictive value was 50%. The results of this study was in accordance with the study of Ologe et al (2013) which found that the sensitivity and specificity of SFAR was 95.1% and 94.8%, respectively, which was higher than the Annesi-Maessano et al (2002) study with 74% and 83% and the Piau et al (2010) with 84% and 81%.[1,16,18]

## Conclusion

The results of this study indicate a high sensitivity of the SFAR questionnaire of 97% and a specificity of 33% while the positive predictive value is 95% and the negative predictive value is 50%. Hence, the SFAR questionnaire may be used to identify AR.

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