ORIGINAL RESEARCH PAPER

Respiratory Medicine

CLINICAL PROFILE OF ALTERNARIA AND ASPERGILLUS SENSITIZATION IN HEALTHY YOUNG ADULTS: A CROSS-SECTIONAL ALLERGEN CHALLENGE STUDY

KEY WORDS:

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ABSTRACT

Fungal allergy is the third most frequent cause of respiratory pathologies and the most related to a poor prognosis of asthma. The genera Alternaria and Cladosporium are the most frequently associated with allergic respiratory diseases, with Alternaria being the one with the highest prevalence of sensitization. Alternaria alternata is an outdoor fungus whose spores disseminate in warm and dry air, reaching peak levels in temperate summers. Alternaria can also be found in damp and insufficiently ventilated houses, causing what is known as sick building syndrome. Thus, exposure to fungal allergens can occur outdoors and indoors. However, not only spores but also fungal fragments contain detectable amounts of allergens and may function as aero allergenic sources. Allergenic extracts of Alternaria hyphae and spores are still in use for the diagnosis and treatment of allergic diseases but are variable and insufficiently standardised, as they are often a random mixture of allergenic ingredients and casual impurities.Aspergillus species constitute the second most common cause of hospital-acquired fungal infections after Candida. It may be seen up to 30% of patients with hematological malignancies.Aspergillosis is a disease caused by Aspergillus, a common mold that lives indoors and outdoors. Most people breathe in Aspergillus spores every day without getting sick. However, people with weakened immune systems or lung diseases are at a higher risk of developing health problems due to Aspergillus. **Background:** Fungal aeroallergens such as Alternaria alternata and Aspergillus fumigatus are well-recognized triggers of allergic airway disease, yet data on sensitization patterns in healthy young adults remain limited. **Objective:** To analyze the clinical phenotype, risk factors, and symptom burden associated with sensitization to Alternaria (Allergen 10) and Aspergillus fumigatus (Allergen 11) in a cohort of 97 individuals undergoing standardized skin prick testing (SPT). **Methods:** We evaluated SPT-confirmed fungal sensitization, symptom profiles (nasal, ocular, skin, respiratory), environmental exposures, family history, and associated triggers. Five subjects demonstrated sensitization to Alternaria, while one subject was sensitized to Aspergillus fumigatus. Clinical characteristics were compared with published fungal-allergy data. **Results:** Alternaria-sensitized individuals exhibited mild but distinct symptom patterns, including intermittent rhinitis (40%), skin sensitivity (20%), and ocular symptoms (40%). Environmental associations included outdoor triggers, dust exposure, and humidity fluctuations. Family history of atopy was present in 60%. The Aspergillus-sensitized individual was asymptomatic, representing latent sensitization. No subject exhibited asthma, wheeze, exercise-induced symptoms, or food allergies. **Conclusion:** In healthy young adults, fungal sensitization—particularly to Alternaria—appears as a subclinical, environment-linked phenotype with mild intermittent symptoms rather than classical allergic disease. Aspergillus sensitization may remain clinically silent. Early identification may help predict future allergic airway disease in high-risk individuals.

INTRODUCTION

Fungal aeroallergens contribute substantially to the global burden of allergic diseases. Alternaria alternata and Aspergillus fumigatus are among the most clinically important fungi due to their strong immunogenicity and environmental persistence. Alternaria spores are associated with severe asthma attacks, particularly in humid climates and during seasonal peaks.[1,2] Aspergillus fumigatus is implicated in asthma exacerbations, airway hyper-responsiveness, and hypersensitivity conditions such as allergic broncho-pulmonary aspergillosis (ABPA).[5,8]

However, the epidemiology of fungal sensitization in healthy young adults without pre-existing allergic disease remains underexplored. Most studies focus on asthmatic or chronic respiratory disease populations.

This study investigates fungal sensitization in young adults who underwent skin prick testing as part of a structured allergen research protocol, aiming to characterize:

- frequency of sensitization
- symptom burden
- environmental triggers
- risk factors and family history
- comparison with classical fungal allergy phenotype

This dataset provides a unique cross-sectional view of early, subclinical fungal sensitization.

METHODS

Study Design

Cross-sectional observational study conducted in a healthy volunteer cohort recruited from a university and medical campus environment.

Participants

N = 97 participants aged 18–30 years.

Inclusion criteria:

- no prior diagnosed asthma
- no chronic respiratory disease
- not on antihistamines within 72 hours

Skin Prick Test

A 12-allergen SPT panel was used.

Fungal allergens analyzed:

- Allergen 10: Alternaria alternata
- Allergen 11: Aspergillus fumigatus

Sensitization was defined as:

- wheal ≥ 3 mm above negative control
- positive histamine response ensured validity

Data Collection

A detailed clinical questionnaire captured:

- nasal/ocular/skin symptoms
- asthma/wheeze history
- food allergy
- environmental exposures
- sleep effects
- exercise effects
- known triggers
- family history of allergy

Analysis

Descriptive statistics, symptom frequencies, and phenotype comparison with established fungal allergy literature.

RESULTS

1. Prevalence of Fungal Sensitization

Allergen	Sensitized Subjects	Prevalence
Alternaria alternata (10)	47, 49, 70, 91, 95	5.15%
Aspergillus fumigatus (11)	98	1.03%

2. Clinical Profile of Alternaria-Sensitized Subjects

Demographics

- 5 subjects; mean age 21.8 years
- 3 males, 2 females

Symptoms

Symptom Type	% (n)
Nasal symptoms (sneezing/rhinorrhea)	40%
Eye symptoms	40%
Skin symptoms	20%
Wheeze/asthma	0%
Food allergy	0%
Sleep disturbance	0%
Exercise-triggered symptoms	0%
Unknown/No symptoms	40%

Environmental Triggers

- Dust exposure: 60%
- Outdoor triggers: 40%
- Humidity/wind: occasional in 20%
- Indoor dampness: minimal

Family History of Allergy

- Present in 60%

(primarily mother or siblings)

Phenotypic Summary

Alternaria sensitization in this cohort was mild, non-asthmatic, and largely intermittent, with variable environmental triggers. No participant exhibited classical Alternaria-induced asthma.

3. Aspergillus Fumigatus Sensitized Participant (Subject 98)

Key Findings:

- Completely asymptomatic
- No nasal, eye, skin, or respiratory complaints
- No environmental triggers
- No family history of allergy
- No polysensitization

Interpretation:

This represents latent sensitization, commonly described in early exposure stages before clinical disease manifests.

4. Comparative Fungal Phenotype

Feature	Alternaria	Aspergillus
Symptomatic	Yes (mild)	No
Rhinitis	Common	Absent
Eye symptoms	Moderate	Absent
Skin symptoms	Occasional	Absent
Asthma/wheeze	None	None
Family history	Strong	None
Clinical phenotype	Subclinical–mild	Silent sensitization

DISCUSSION

This study highlights the distinct clinical phenotype of fungal sensitization among healthy young adults, contrasting sharply with the severe asthma phenotypes reported globally.

1. Alternaria Sensitization

Our Alternaria-sensitized participants exhibited:

- mild rhinitis
- dust/outdoor-triggered symptoms
- minimal lower-airway involvement
- substantial family history of atopy

This aligns with earlier observations showing Alternaria as a strong environmental allergen but with symptom expression dependent on genetic predisposition and spore concentration.[3,15,21]

Notably, no subject demonstrated exercise-induced bronchospasm, persistent wheezing, or severe allergic disease — findings consistent with early-stage sensitization noted in community-based studies.[18,22]

2. Aspergillus Sensitization

Only one subject demonstrated Aspergillus reactivity, and was completely asymptomatic.

This supports the idea that Aspergillus sensitization may precede disease by years, especially in genetically predisposed individuals.[5,8,10]

3. Implications

Even mild fungal sensitization may predict:

- future allergic rhinitis
- progression to asthma in high-risk individuals
- seasonal symptom variation

Hence, early detection in healthy adults is clinically relevant, even in absence of symptomatic disease.

CONCLUSION

Sensitization to Alternaria and Aspergillus among healthy young adults exists as a subclinical but identifiable phenotype.

Alternaria sensitization manifests with mild rhinitis and ocular symptoms, while Aspergillus sensitization may remain entirely silent. These findings emphasize the importance of routine fungal testing in research cohorts and early-risk populations.

REFERENCES

1. Black PN, Udy AA, Brodie SM. Allergy. 2000;55(5):501-4.
2. Twaroch TE, Curin M, Valenta R, Swoboda I. Allergy Asthma Immunol Res. 2015;7(3):205-20.
3. Barnes C, et al. Ann Allergy Asthma Immunol. 2001;87(5):S49-52.
4. Pulimood TB, et al. Clin Exp Allergy. 2007;37:1184-93.
5. Knutsen AP, et al. J Allergy Clin Immunol. 2012;129:280-91.
6. O'Driscoll BR, et al. Curr Opin Pulm Med. 2005;11:48-54.
7. Bush RK, Prochnau JJ. J Allergy Clin Immunol. 2004;113:227-34.
8. Shah A, Panjabi C. Indian J Chest Dis Allied Sci. 2010;52:107-14.
9. Denning DW, et al. Clin Transl Allergy. 2014;4:14.
10. Agarwal R, et al. Indian J Med Res. 2015;142:579-97.
11. Simon-Nobbe B, et al. Int Arch Allergy Immunol. 2008;145:58-86.
12. Salo PM, et al. J Allergy Clin Immunol. 2006;118:892-8.
13. Zureik M, et al. BMJ. 2002;325:411-4.
14. Denning DW, et al. Clin Exp Allergy. 2006;36:451-61.
15. Halonen M, et al. J Allergy Clin Immunol. 1997;99:347-52.
16. Kustrzeba-Wójcicka I, et al. Ann Agric Environ Med. 2014;21:803-7.
17. Lloyd CM, Saglani S. Immunology. 2010;131:305-12.
18. Tosca MA, et al. Pediatr Allergy Immunol. 2016;27:503-13.
19. Vicente-Serrano M, et al. J Investig Allergol Clin Immunol. 2017;27:239-50.
20. Delfino RJ, et al. Environ Health Perspect. 2002;110:A607-17.
21. Andersson M, et al. Pediatr Allergy Immunol. 2003;14:100-7.
22. Baumann LM, et al. J Allergy Clin Immunol. 2015;136:1671-8.
23. Singh A, Nanda S, Shah A. Curr Allergy Asthma Rep. 2017;17:52.
24. Kurup VP, et al. Indian J Respir Care. 2000;103:1-12.
25. Portnoy J, Shroba J. Curr Allergy Asthma Rep. 2014;14:454.
26. Baxi SN, et al. J Allergy Clin Immunol Pract. 2016;4:396-404.