Scientific Research Publishing

Open Journal of Immunology, 2025, 15(3), 41-56
https://www.scirp.org/journal/oji
ISSN Online: 2162-4526
ISSN Print: 2162-450X

Ten-Year Review of Allergology Consultations in Abidjan: Clinical, Immunological, and Environmental Profiles in a Sub-Saharan Context

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How to cite this paper: Dasse, S.R., Kouacou, A.P., Siransy, K.L., Nguessan, K., Adou, A.H., Yeboah, O.R., Seri, Y.J., Assi, A.U.A., Memel, L.C.R., Moussa, S., Oura, D., Koya, H. and Attoukoula, A.T.E. (2025) Ten-Year Review of Allergology Consultations in Abidjan: Clinical, Immunological, and Environmental Profiles in a Sub-Saharan Context. *Open Journal of Immunology*, **15**, 41-56.
https://doi.org/10.4236/oji.2025.153003

Received: July 1, 2025
Accepted: September 25, 2025
Published: September 28, 2025

Abstract

Introduction: In sub-Saharan Africa, allergic diseases are increasing, but their management remains limited due to a lack of specialized centers, appropriate diagnostic tools, and local epidemiological data. To address these challenges, an immunology-allergology unit was established at Cocody University Hospital in Abidjan. **Objective:** To describe the clinical, immunological, and environmental characteristics of patients consulting for suspected allergy over a ten-year period. **Methods:** A retrospective, descriptive, and analytical study was conducted using 350 patient records from the allergology outpatient clinic between January 2015 and December 2024. Sociodemographic, clinical, and environmental data, along with results from skin, biological, and functional allergy tests, were analyzed using Epi Info version 7.2.4. A p-value < 0.05 was considered statistically significant. **Results:** Cutaneous symptoms were the most common (46.3%), followed by respiratory manifestations (33.1%). An atopic background was identified in 92.6% of patients. Skin prick tests, performed in 85.3% of cases, revealed polysensitization in 67.1%, mainly to aeroallergens (44.6%) such as *Blomia tropicalis* and *Glycyphagus domesticus*, and to food allergens (16.9%) such as peanut, egg, and crab. Biological (total/specific IgE, eosinophils) and functional (spirometry, provocation tests) assessments were infrequently available. Allergen avoidance, antihistamines, and corticosteroids were the most prescribed treatments. Allergen immunotherapy was initiated in 5.1% of cases. **Conclusion:** This ten-year review highlights the predominance of perennial tropical allergens and the high rate of polysensitization in an urban context. It underscores

the need to improve access to specialized allergy diagnostics and to strengthen local capacities in allergology.

Keywords

Allergy, Polysensitization, Tropical Mites, Côte d'Ivoire

1. Introduction

In recent decades, the prevalence of allergic diseases has been steadily increasing in many parts of the world. According to the World Health Organization (WHO), nearly 50% of the global population could be affected by some form of allergy by 2050 [1]. In sub-Saharan Africa, although data remain limited, several studies report a growing portion of the population affected, particularly by asthma and allergic rhinitis [2]-[4]. However, institutional recognition of these conditions has been delayed, often overshadowed by priority health concerns such as malaria, tuberculosis, and HIV/AIDS. Rapid urbanization, lifestyle changes, air pollution, and alterations in domestic environments have contributed to the emergence of allergic diseases in major African cities [3].

In Côte d'Ivoire, clinical allergology is still an emerging discipline. Consultations for asthma, allergic rhinitis, chronic urticaria, or eczema are increasing, but management remains hindered by multiple challenges: a limited number of trained specialists, restricted access to diagnostic testing, high cost of evaluations, unavailability of allergen extracts suited to the tropical climate, and above all, a lack of regional epidemiological data on sensitization patterns [3] [4].

Since 2014, the University Hospital Center (UHC) of Cocody in Abidjan—one of the few specialized centers in the country—has established an Immunology-Allergology Unit offering specialized consultations and comprehensive diagnostic workups. Previous studies conducted by our team have investigated specific sensitization profiles, such as to tropical mites [5]-[7], cow's milk proteins [8], coffee/tea in atopic sickle cell patients [9], and anesthetic allergens [10]. However, no comprehensive review has yet been conducted on all allergy consultations performed at our center. This study aims to provide a retrospective overview of ten years of hospital-based allergology practice at UHC Cocody by describing patient profiles, diagnostic approaches, identified allergens, and therapeutic strategies, in order to optimize future management in an African context.

2. Methods

2.1. Study Design and Setting

We conducted a retrospective, descriptive, and analytical study of allergology consultations carried out at the Immunology-Allergology Unit of the University Hospital Center of Cocody in Abidjan, Côte d'Ivoire, over a ten-year period from January 2015 to December 2024. This specialized unit, attached to the Immunology La-

boratory, manages patients referred for suspected allergic conditions and conducts necessary diagnostic evaluations (skin tests, biological assays, functional tests).

2.2. Study Population

The study included all patients—both children and adults—who consulted the unit for suspected type I (immediate, IgE-mediated) allergy during the study period and underwent a documented allergologic assessment. Follow-up consultations without new evaluations, as well as patients referred for opinion only without testing, were excluded.

From 2012 (the year the Allergy Unit was established) to 2024, a total of 1,860 patients were registered for regular follow-up. We recorded a 37.2% rate (692 patients) of loss to follow-up (only one consultation) or unusable medical records. In these records, data confirming the clinical diagnosis were missing in some cases; in others, results of the skin prick test or measurements of specific IgE (when discrepancies existed between established clinical evidence and inconclusive skin tests) or information on personal or family history of atopy were not available. These cases of loss to follow-up or unusable records were concentrated in 86.85% of instances during the period from 2012 to 2014. Consequently, our sample was drawn from the period 2015 to 2024, including 1,209 patients who were regularly followed (more than five medical consultations per patient), with fully documented medical records. The exclusion rate for the same reasons mentioned above was 3.39%. The sample size "N" was calculated using Schwarz's formula [$N = \varepsilon^2 \times P \times (1-P)/i^2$, where ε = 1.96; P = prevalence; i = 5%]. Based on unpublished data from a preliminary study evaluating the frequency of atopic diseases, the prevalence was estimated at approximately 29% among Ivorians. The estimated sample size of 316 was intentionally increased to 350.

2.3. Inclusion Criteria

Only patients meeting all of the following criteria were included in the study:

- Patients presenting with a confirmed atopic condition based on medical history, clinical examination including skin prick testing and/or biological testing (specific IgE);
- Patients with a complete medical record who had been regularly followed up (at least four medical consultations).

2.4. Exclusion Criteria

- Non-IgE-mediated clinical manifestations (Type II, III, or IV), confirmed based on the onset timing and clinical signs;
- Incomplete or unusable records (missing history or test results);
- Follow-up visits without new diagnostic workup.

2.5. Data Collection

Data were extracted using a standardized form from archived medical records.

The following variables were collected:

- Sociodemographic data: age, sex, occupation, activity sector
- Atopic background: personal or family history of allergy (asthma, eczema, rhinitis, urticaria)
- Clinical manifestations: categorized as cutaneous (urticaria, eczema), respiratory (rhinitis, asthma), ocular (conjunctivitis), systemic (anaphylaxis), or mixed
- Suspected or identified triggering factors: airborne allergens (mites, molds), food allergens, drug-related, occupational, or unidentified
- Allergy investigations:
  - *Skin tests:* prick tests using the standard European panel, and when appropriate, realistic prick tests or patch tests
  - *Biological tests:* total IgE (measured by immunoenzymatic methods), specific IgE, blood eosinophils, serum tryptase
  - *Functional tests:* spirometry, provocation tests (bronchial, nasal, oral)
- Therapeutic management: documented prescriptions including allergen avoidance, antihistamines, corticosteroids, injectable epinephrine, and specific allergen immunotherapy

2.6. Technical Procedures

Prick tests were performed according to current international guidelines [11], after discontinuation of antihistamines for at least five days. A test was considered positive for a wheal diameter ≥ 3 mm compared to the negative control. Allergen extracts used were obtained from certified suppliers (e.g., Stallergènes®, ALK-Abelló®, or others). Biological assays were conducted at the UHC Immunology Laboratory following standard protocols.

2.7. Statistical Analysis

Data were entered and analyzed using Microsoft Excel 2016 and Epi Info version 7.2.4. Qualitative variables were presented as counts (n) and percentages (%), and quantitative variables as means ± standard deviation. Cross-tabulations were used to assess associations between clinical manifestations, atopic profiles, triggering factors, test results, and treatments. The Chi-squared test was used to compare proportions, with statistical significance set at $p < 0.05$.

2.8. Ethical Considerations

The study was conducted in accordance with the ethical principles of biomedical research. Data were obtained exclusively from archived medical records and anonymized before analysis. The study received approval from the Institutional Ethics Committee of UHC Cocody **(N°/CHU-C/DMS/RG-05/06/25)**.

3. Results

3.1. General Characteristics of the Study Population

Over the ten-year period (2015-2024), a total of 350 patients were included. The

mean age was 29.9 ± 18.5 years, ranging from 1 to 74 years. A female predominance was observed (61.7%). Students constituted the largest occupational group (26.3%), followed by workers/artisans (16.3%) and education professionals (13.4%) (Table 1).

Table 1. Clinical and environmental characteristics of patients according to the clinical presentation of allergy.

Category	Subcategory	Cutaneous n = 162	Respiratory n = 116	Ocular n = 32	General n = 30	Mixed (n = 10)	Total (n = 350)
Type of Atopy	None	10	9	3	3	1	26
	Familial	14	8	10	3	3	38
	Familial, personal	117	85	14	17	4	237
	Personal	21	14	5	7	2	49
Triggering conditions	Aeroallergens	67	57	15	13	4	156
	Food allergens	33	15	5	4	2	59
	Drug-induced	7	5	3	2	1	18
	Non-allergenic factors	17	26	5	7	2	57
	No identified trigger	38	13	4	4	1	60
Smoking Status	Active smoker	44	47	14	16	5	126
	Passive smoker	27	24	7	10	2	70
	Non-smoker	91	45	11	4	3	154
Animal Exposure	Exposed	70	80	17	16	4	187
	Not exposed	92	36	15	14	6	163
Housing Conditions	Allergen-promoting	125	82	26	21	4	248
	Non-allergen-promoting	37	34	6	9	6	92
Stress Level	High	46	32	10	12	5	105
	Moderate	72	48	13	10	3	146
	Low	44	36	9	8	2	99
Occupational Sector	Trade, technical jobs	22	15	5	5	2	49
	Workers and artisans	27	18	4	7	1	57
	Administrative profession	21	12	4	5	1	43
	Healthcare sector	10	4	1	3	1	19
	Education	17	20	4	4	2	47
	Students	40	37	11	2	2	92
	Unemployed	25	10	3	4	1	43

Continued

Sex	Female	126	61	17	8	4	216
	Male	36	55	13	14	6	134
Age	0 - 5 years	10	16	8	5	5	43
	6 - 15 years	48	35	8	4	3	98
	≥16 years	104	65	16	21	2	209

This table summarizes the distribution of various demographic, clinical, and environmental characteristics across different clinical forms of allergic manifestations: cutaneous (n = 162), respiratory (n = 116), ocular (n = 32), general (n = 30), and mixed presentations (n = 10), for a total of 350 patients. Atopic status is categorized as none, familial, personal, or both familial and personal. Triggering circumstances include aeroallergens, food allergens, drug-related reactions, and non-allergenic factors (such as infections or irritants), while some patients reported no identifiable triggers. Smoking status, exposure to animals, type of housing (promoting or not the accumulation of indoor allergens), stress level, occupation, sex, and age group are also detailed. Notably, cutaneous manifestations were the most frequent, and a strong association was observed with familial and personal atopy as well as environmental exposures.

3.2. Clinical Profile of Allergic Manifestations

The most common clinical manifestations were cutaneous (urticaria, eczema) in 46.3% of cases, followed by respiratory symptoms (rhinitis, asthma) in 33.1%. Other presentations included ocular symptoms (conjunctivitis: 9.1%), generalized/systemic reactions (8.6%), and mixed forms (2.9%) (Table 1). Among respiratory presentations, a rhinitis-asthma association was identified in 37.1% of cases.

3.3. Atopic Background and Environmental Exposure

An atopic predisposition was found in 92.6% of patients, with both personal and familial history present in 67.7% of cases. The most frequently reported environmental risk factors included allergenic housing conditions (70.9%), exposure to domestic animals (53%), active or passive tobacco smoke exposure (36%), and high perceived stress levels (30%) (Table 1).

3.4. Suspected Triggering Factors

Airborne allergens were the most commonly suspected triggers (44.6%), especially tropical mites such as *Blomia tropicalis* (48.1%) and *Glycyphagus domesticus* (25.6%). Food allergens (16.9%) mainly involved peanut (42.4%), egg (27.1%), and crab (22.0%). Drug-related allergens accounted for 5.1%, and occupational exposures were rare. No identifiable trigger was reported in 17.1% of patients (Table 1 and Table 2, Figure 1).

3.5. Allergological Investigations

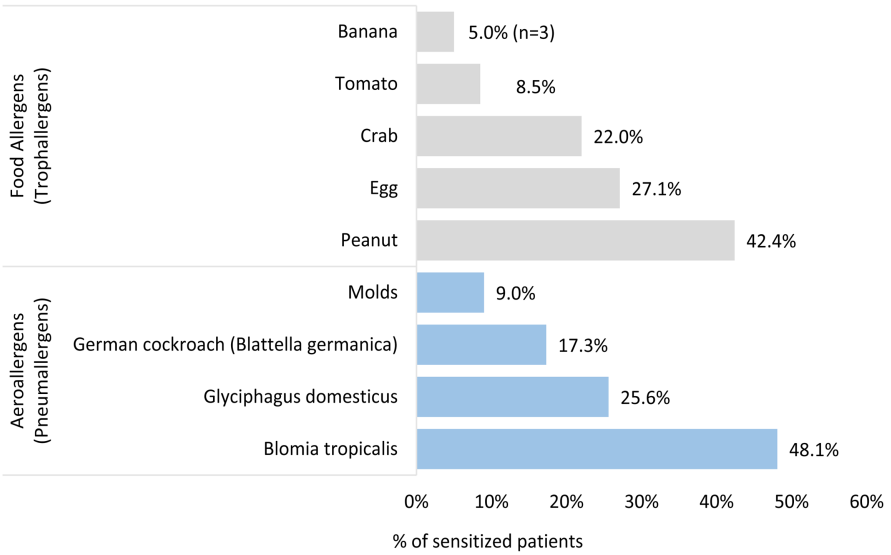
Skin prick tests were performed in 298 patients (85.3%), with a positivity rate of 96.7%. Polysensitization (≥3 allergens) was observed in 67.1% of tested patients. Patch tests were conducted in 8.4% of cases (Table 3).

Biological tests were less frequently performed: specific IgE assays in 19.8% of patients, total IgE in 15.1%, blood eosinophil counts in 8.4%, and serum tryptase in 6%. Functional assessments were conducted in a minority of cases: spirometry (12%), bronchial challenge tests (3.5%), nasal provocation (2.3%), and oral challenge (0%) (Table 3).

Table 2. Distribution of identified triggering factors according to the type of atopy.

Triggering Factor	None	Familial	Familial and Personal	Personal	Total
Aeroallergens	10	18	101	27	156
Food allergens	6	10	35	8	59
Drug-induced	2	3	10	3	18
Non-allergenic factors	4	5	40	8	57
No identified trigger	4	2	51	3	60
Total	26	38	237	49	350

This table presents the distribution of triggering factors identified among the study population, stratified by type of atopy : none, familial, personal, or both familial and personal. Aeroallergens (e.g., dust mites, pollen), food allergens, drug-induced triggers, and non-allergenic factors (e.g., infections, physical stimuli, irritants) were reported. A subgroup of patients did not report any identifiable triggering factor. The majority of identified triggers were found among individuals with both familial and personal atopy. The total number of participants included in this analysis was 350.



This figure illustrates the most frequently identified allergens among patients who underwent skin prick testing. Aeroallergens, particularly *Blomia tropicalis* and *Glycyphagus domesticus*, were the most common sensitizers. Other relevant aeroallergens included *Blattella germanica* (German cockroach) and molds. Among food allergens, peanut, egg, crab, tomato, and banana were the most frequently involved. The predominance of tropical house dust mites highlights the need for region-specific diagnostic tools in urban African settings.

Figure 1. Major allergens identified in sensitized patients (n = 298).

Table 3. Allergen testing performed: Frequency and sensitization profiles.

Variable	Number (n)	Frequency (%)
Prick test	298	85.3
• No sensitization	30	10.1
• Monosensitized (1 allergen)	16	5.4
• Oligosensitized (2 to 3 allergens)	51	17.1
• Polysensitized (more than 3 allergens)	200	67.1
Patch test	29	8.4
• No sensitization	5	17.2
• Monosensitized (1 allergen)	11	37.9
• Oligosensitized (2 to 3 allergens)	3	10.3
• Polysensitized (more than 3 allergens)	10	34.5
• No test performed	55	15.8
Biological Parameters		
• Eosinophil count	29	8.4
• Total IgE	53	15.1
• Specific IgE	69	19.8
• Tryptase level	21	6.0
Functional Tests		
• Nasal provocation test	8	2.3
• Bronchial provocation test	12	3.5
• Spirometry	42	12.0

This table details the diagnostic procedures conducted among the 350 patients. Skin prick tests were performed in 85.3% of cases, with a high rate of polysensitization (more than 3 allergens) observed in 67.1% of tested individuals. Patch tests were less frequently used (8.4%) and showed a similar trend. A subset of patients (15.8%) did not undergo any skin testing. Biological assessments included total and specific IgE quantification, eosinophil counts, and tryptase levels, though access remained limited. Functional testing (nasal and bronchial provocation, spirometry) was underutilized, reflecting diagnostic constraints in resource-limited settings.

3.6. Therapeutic Management

Avoidance measures were prescribed in 95.7% of cases, followed by antihistamines (93.7%) and corticosteroids (53.7%). Injectable epinephrine was administered in 7.1% of patients, primarily in cases of systemic reactions. Allergen-specific immunotherapy was initiated in 5.1% of patients (Table 4).

Table 4. Treatments prescribed according to the type of allergic manifestation.

Treatment	Cutaneous	Respiratory	Ocular	General	Mixed	Total
Allergen avoidance	140	120	25	28	22	335 (95.7%)
Antihistamines	150	110	30	18	20	328 (93.7%)
Corticosteroids	95	70	10	8	5	188 (53.7%)
Injectable adrenaline	1	1	0	22	1	25 (7.1%)
Immunotherapy	2	7	1	1	7	18 (5.1%)

This table presents the distribution of therapeutic interventions according to the clinical form of allergy. Avoidance measures and antihistamines were the most frequently prescribed treatments across all types of manifestations. Corticosteroids were mainly used in cutaneous and respiratory forms, while injectable adrenaline was primarily reserved for systemic reactions. Allergen-specific immunotherapy (AIT) was initiated in a small subset of patients, especially those with mixed or respiratory forms.

3.7. Statistical Analysis Results

Several statistically significant associations were identified (Table 5):

- Between sex and clinical manifestations ($p < 0.001$)
- Between atopy type and clinical manifestations ($p = 0.0078$)
- Between polysensitization and multiple clinical forms ($p < 0.001$)
- Between type of clinical manifestation and prescribed treatments ($p < 0.0001$)

No significant association was found between triggering factors and clinical manifestations ($p = 0.23$), nor between occupational sector and allergic presentations ($p = 0.79$).

Table 5. Statistical analysis of associations between clinical, atopic, environmental, and therapeutic variables.

Comparison	Chi² Value	df	p-value
Sex vs Clinical manifestations	30.20	4	< 0.001 (S)
Type of atopy vs Clinical manifestations	26.96	12	0.0078 (S)
Triggering factors vs Type of atopy	15.90	12	0.196 (NS)
Triggering factors vs Clinical manifestations	19.77	16	0.23 (NS)
Polysensitization vs Multiple clinical forms	23.77	1	< 0.001 (S)
Occupational sector vs Clinical manifestations	18.25	24	0.79 (NS)
Clinical manifestations vs Treatments prescribed	254.37	16	< 0.0001 (S)

This table summarizes the results of chi-square tests used to assess relationships between key variables. Significant associations were found between sex and clinical manifestations, type of atopy and clinical manifestations, polysensitization and multiple clinical forms, and between clinical manifestations and prescribed treatments. No significant associations were observed between triggering factors and atopy, or between occupational sector and clinical forms. A p-value < 0.05 was considered statistically significant (S), whereas $p \geq 0.05$ was considered not significant (NS).

4. Discussion

This retrospective study, conducted over a ten-year period at the University Hospital of Cocody, aimed to provide an overview of allergological diagnostic practices in an Ivorian hospital setting. Cutaneous manifestations dominated the clinical presentation, followed by respiratory involvement. This distribution contrasts with observations from Western countries, where asthma and rhinitis are the most frequent reasons for allergology consultations [11] [12], but aligns with global data indicating that atopic dermatitis and urticaria are among the most common allergic manifestations [13]. In Central Africa, recent studies have highlighted an increasing prevalence of asthma and allergic rhinitis, particularly in Libreville [14]. The predominance of cutaneous involvement in females in our cohort, already reported in the literature, may be related to hormonal, immunological, and sociocultural factors [15] [16]. Atopic predisposition, observed in over 90% of cases, reflects a genetic susceptibility potentially amplified by multiple environmental exposures specific to the tropical climate (humidity, domestic allergens, urban pollution) [16]. This susceptibility, further influenced by factors such as early-life infections or nutrition, fits within a multifactorial framework of allergic sensitivity [14] [17]. In this study, no significant association was found between atopy and the triggering factors of clinical manifestations. Indeed, it is well known that in atopic individuals, clinical symptoms may be triggered by certain factors, but not systematically nor in a predictable manner. The clinical expression is determined by complex interactions between genetic predisposition, environmental influences, general health status, and specific exposures.

An increasing number of studies have highlighted the role of epigenetic mechanisms in modulating allergic risk [17]. This context may account for the high rate of polysensitization observed (over two-thirds of cases), consistent with other African data [3] [4] [14]. Polysensitization may reflect the activation of complex immunopathological mechanisms. Recent studies point to exaggerated Th2 cell responses, dysregulation of regulatory T cells (Treg), and epithelial barrier remodeling that promotes multiple sensitizations [16].

Cross-exposure to homologous allergens, such as tropomyosins from mites and crustaceans, supports this hypothesis, suggesting that local allergen immunodominance should inform the development of region-specific molecular tests. The association between polysensitization and the multiplicity of clinical manifestations underscores the importance of systematic screening and a multidisciplinary approach [18]. The predominant sensitizations to tropical mites such as *Blomia tropicalis* and *Glycyphagus domesticus*, already reported in other African studies [7] [19] [20], reflect continuous exposure to non-seasonal domestic allergens. Co-exposure to these mites and the resulting cross-reactivities partly account for the high rate of polysensitization [7] [21]. However, the dissociation between the sensitization profile (dominated by airborne allergens) and the clinical manifestations (predominantly cutaneous) suggests potential consultation or diagnostic biases, underscoring the need for complementary testing to refine clinical correla-

tion. Cutaneous lesions, being more visible and often perceived as more disabling, are more likely to prompt specialized consultation [22].

Limited access to biological (specific IgE) and functional (spirometry, challenge tests) investigations reflects the technical and economic constraints of the context. This situation, common in sub-Saharan Africa [15], hinders the comprehensive assessment of food or drug allergies, complicates the distinction between sensitization and clinical allergy, and may lead to underdiagnosis, particularly of allergic asthma. In our setting, the unavailability of on-site testing, long sample transport times, and the high cost of biological reagents—often not covered by national health systems—limit both diagnostic accuracy and access to etiological management. A concrete strategy to improve accessibility would be to develop public–private partnerships for the local implementation of specific IgE assay platforms, coupled with simplified, validated immunotherapy protocols tailored to locally prevalent allergens (e.g., *Blomia tropicalis*), with subsidized pricing for vulnerable patient associations. Furthermore, the absence of molecular allergy testing (component-resolved diagnostics such as ISAC® or ALEX®) prevents the identification of major epitopes or cross-reactivities (e.g., *Blot t* 5 vs. *Der p* 10). This gap reduces the effectiveness of allergen-specific immunotherapy (ASI), whose initiation remains marginal (5.1%). Yet, in settings of polysensitization with allergic asthma or rhino-conjunctivitis, ASI could alter the course of allergic disease, prevent progression to severe forms, and improve quality of life [23]-[25]. Additionally, some diagnostic methods such as prick-to-prick testing—particularly useful for fresh food allergens in the absence of standardized extracts—remain underutilized in our setting. Their integration could nevertheless enhance the identification of clinically relevant sensitizations [26]. **From a therapeutic perspective**, management is primarily based on allergen avoidance measures and symptomatic treatment (antihistamines and corticosteroids), with limited access to biologics (Omalizumab, Dupilumab) due to cost constraints and the lack of validated local protocols. This situation highlights the urgent need to adapt international guidelines to African economic realities, with a focus on cost-effective interventions (targeted avoidance, therapeutic education, simplified allergen immunotherapy) [27] [28]. The significant association between clinical manifestations and prescribed treatments reinforces the relevance of personalized management strategies based on clinical severity [18]. **Clinical implications:** The insufficient number of trained allergists, combined with the lack of diagnostic tools adapted to tropical allergens, remains a major barrier to improving care. In 2020, approximately 200 allergists were reported across Africa [29], a number that rose to 315 by 2025 according to the 20th Francophone Allergy Congress. Nevertheless, this progress remains inadequate in view of the growing needs. Institutional recognition of allergology as a healthcare priority, the integration of dedicated training programs, and the development of regionally standardized diagnostic tests are essential levers for change. Furthermore, allergic diseases have a broader impact beyond clinical symptoms. Their indirect economic burden—through reduced

productivity, absenteeism, and increased healthcare utilization—remains underexplored in Africa, though evidence from other regions underscores its significance. This calls for their inclusion in national public health strategies [30]. Despite these limitations, several research perspectives can be envisioned to advance tropical allergology in Africa. First, prospective epidemiological studies, including rural areas, are needed to better estimate the true prevalence of allergic diseases and characterize population-specific profiles. Second, investigating the impact of common parasitic co-infections in tropical regions on IgE production and skin test reactivity could help distinguish clinically relevant sensitizations from asymptomatic ones. Third, the high rate of polysensitization observed in this population—particularly among young adults—could represent a relevant immunological model for studying interactions between tropical allergens and Th2-type immunity. This context opens promising avenues for translational research, including immunological phenotyping (cytokines IL-4, IL-5, IL-13, IL-10) [31] [32], characterization of lymphocyte subpopulations (CD4+ T cells, Treg, ILC2s) [32] [33], and microbiome profiling of skin and respiratory mucosa [34]-[36]. These approaches could support better patient stratification and guide the development of personalized therapeutic strategies. In addition, the use of component-resolved diagnostics (specific IgE to molecular allergens) is essential to differentiate between cross-reactive and primary sensitizations, thereby refining therapeutic indications. Contextualized clinical trials—particularly those evaluating allergen-specific immunotherapy targeting *Blomia tropicalis*—should be encouraged to assess both efficacy and feasibility in local settings. Finally, socio-anthropological studies are necessary to understand barriers to allergological care (cost, self-medication, cultural beliefs) and to design appropriate community-based interventions. This multidimensional and transdisciplinary approach is crucial to advance diagnostic and therapeutic practices and to provide an effective and equitable response to the growing burden of allergic diseases in sub-Saharan Africa.

Strengths and Limitations: Our study benefits from a ten-year retrospective analysis and a representative sample from a national referral center, providing satisfactory external validity in the Ivorian context. It offers a solid foundation for improving allergy care organization, developing adapted allergen test panels, and formulating context-specific clinical recommendations. However, several limitations must be acknowledged. The retrospective design exposes the study to potential data collection bias (missing data, heterogeneous records), and the lack of molecular testing limits the precision of sensitization profiling. Its monocentric nature may also constrain the generalizability of the results. Finally, the absence of longitudinal follow-up prevents evaluation of disease progression and treatment outcomes, particularly regarding allergen immunotherapy.

5. Conclusion

This retrospective study provides a ten-year overview of allergological practice at the Cocody University Hospital. It reveals a high prevalence of polysensitization,

predominantly to perennial tropical allergens, with clinical profiles largely marked by cutaneous and respiratory manifestations. However, limited access to biological and functional investigations impedes comprehensive immunological diagnosis. These findings underscore the need to strengthen local capacity: developing diagnostic tools adapted to the tropical context, providing targeted training for healthcare professionals, and integrating allergic diseases into public health priorities. Beyond its local implications, this study outlines a clinical model of tropical allergology that may inform future translational research. The development of specific molecular diagnostic tools, the integration of immunological biomarkers, and the evaluation of innovative interventions (tropicalized immunotherapy, tailored educational programs, accessible biologics) represent key development axes. Implementing these strategies requires close collaboration between hospital centers, research teams, and public health authorities.

Authors' Contribution

Dasse Sery Romualde conceptualized, coordinated and designed the study. Kouacou Amah Patricia Victorine drafted the manuscript and contributed to its design; Siransy K.L., Nguessan Koffi, Adou AH, Yeboah Or, Seri Yida Jocelyne, Assi Aya Ursule Aniela, Memel Lasme Charline Roselle, Moussa Salimata, Oura Doris, Koya H, Attoukoula LA critically reviewed it and contributed to perform skin tests.

Acknowledgements

Special thanks to all patients included with their consent in this study.

Conflicts of Interest

The authors declare that they have no competing interests; This work is entirely supported by "Immunopôle (Laboratoire d'Immunologie de l'UFR Sciences médicales—Université Felix Houphouet BOIGNY-Abidjan (Côte d'Ivoire)".

References

[1] Pawankar, R. (2014) Allergic Diseases and Asthma: A Global Public Health Concern and a Call to Action. *World Allergy Organization Journal*, **7**, Article 12. https://doi.org/10.1186/1939-4551-7-12

[2] Bousquet, J., Schünemann, H.J., Samolinski, B., Demoly, P., Baena-Cagnani, C.E., Bachert, C., *et al.* (2012) Allergic Rhinitis and Its Impact on Asthma (ARIA): Achievements in 10 Years and Future Needs. *Journal of Allergy and Clinical Immunology*, **130**, 1049-1062. https://doi.org/10.1016/j.jaci.2012.07.053

[3] Tapsoba, P.G., Ouédraogo, N.A., Ndiaye, M., Ouédraogo, M.S., Traoré, F., Bognini, D.J., *et al.* (2017) Profil allergénique des patients symptomatiques réalisant des prick-tests dans une structure sanitaire privée de la ville de Ouagadougou (Burkina Faso). *Science et Technique*, *Série Sciences de la Santé*, **40**, 9-17.

[4] Agodokpessi, G., Sagbo, G., Bigot, C., Hountohotegbe, T., Dossou-Yovo, S., Djogbessi, D., *et al.* (2019) Sensibilisation aux acariens chez les enfants suivis pour allergie

respiratoire en milieu tropical africain à Cotonou, Bénin. *Revue des Maladies Respiratoires*, **36**, 135-141. https://doi.org/10.1016/j.rmr.2018.01.016

[5] Dasse, S., Siransy, L., Yeboah, R., Adou, H., Koffi, N., Kouakou, P., *et al.* (2016) État de sensibilisation aux allergènes aéroportés chez le drépanocytaire à Abidjan—Côte d'Ivoire. *Revue Française d'Allergologie*, **56**, 283. https://doi.org/10.1016/j.reval.2016.02.054

[6] Adou, A.H., Siransy, L., Kouacou, A.P., Yeboah, R., N'guessan, K. and Dassé, S.R. (2017) Évaluation des mesures d'éviction des acariens dans la rhinite allergique au CHU de Cocody, Abidjan. *Revue Française d'Allergologie*, **57**, 244-245. https://doi.org/10.1016/j.reval.2017.02.089

[7] Dasse, S.R., Adou, A.H., Siransy, K.L., Kouacou, A.P.V. and Yeboah, O.R. (2019) Sensibilisation aux acariens: Fréquence et allergènes croisants avec les crustacés chez le sujet suivi en consultation d'allergologie en Côte d'Ivoire. *Revue Française d'Allergologie*, **59**, 254. https://doi.org/10.1016/j.reval.2019.02.049

[8] Dassé, S.R., Kouacou, A.P.V., Adou, A.H., Yeboah, O.R., Assi, A.U.A., Siransy, K.L., *et al.* (2024) État de sensibilisation allergénique aux protéines de lait de vache chez les enfants de 0 à 3 ans suivis au service de Pédiatrie du CHU de Cocody-Abidjan (Côte d'Ivoire). *Revue Française d'Allergologie*, **64**, Article ID: 103829. https://doi.org/10.1016/j.reval.2024.103829

[9] Adou, A.H., Siransy, L., Yeboah, R., Kouacou, A.P., N'Guessan, K. and Dassé, R. (2017) État de sensibilisation allergénique au café et au thé chez le drépanocytaire atopique. *Revue Française d'Allergologie*, **57**, 356-363. https://doi.org/10.1016/j.reval.2017.02.148

[10] Dassé, S.R., Adou, A.H., Siransy, K.L., Yeboah, O.R., Kouacou, A.P.V., Assi, A.U.A., *et al.* (2024) Fréquence de la sensibilisation aux anesthésiques: Intérêt de l'enquête allergologique dans les consultations pré anesthésiques en Côte d'Ivoire. *Revue Française d'Allergologie*, **64**, Article ID: 103969. https://doi.org/10.1016/j.reval.2024.103969

[11] Bousquet, J., Heinzerling, L., Bachert, C., Papadopoulos, N.G., Bousquet, P.J., Burney, P.G., *et al.* (2012) Practical Guide to Skin Prick Tests in Allergy to Aeroallergens. *Allergy*, **67**, 18-24.

[12] Kristiansen, M., Dhami, S., Netuveli, G., Halken, S., Muraro, A., Roberts, G., *et al.* (2016) Allergen Immunotherapy for the Prevention of Allergy: A Systematic Review and Meta-Analysis. *Pediatric Allergy and Immunology*, **28**, 18-29. https://doi.org/10.1111/pai.12661

[13] Hon, K.L., Chu, S. and Leung, A.K.C. (2022) Quality of Life for Children with Allergic Skin Diseases. *Current Pediatric Reviews*, **18**, 191-196. https://doi.org/10.2174/1573396317666210901124211

[14] Mvoundza Ndjindji, O., Minto'o Rogombe, S., Mougola Bissiengou, P., Mveang-Nzoghe, A., Leboueny, M., Mbina, O., *et al.* (2023) Allergen Sensitization and Polysensitization Pattern of Adults and Children in an Urban Sub-Saharan African Setting (Libreville, Gabon). *Journal of Allergy and Clinical Immunology*: *Global*, **2**, 23-29. https://doi.org/10.1016/j.jacig.2022.10.005

[15] Mvoundza Ndjindji, O. and Djoba Siawaya, J.F. (2022) Mapping Allergic Diseases in Sub-Saharan Africa. *Frontiers in Allergy*, **3**, Article 850291. https://doi.org/10.3389/falgy.2022.850291

[16] DeVries, A. and Vercelli, D. (2015) Epigenetics in Allergic Diseases. *Current Opinion in Pediatrics*, **27**, 719-723. https://doi.org/10.1097/mop.0000000000000285

[17] Genuneit, J. and Standl, M. (2021) Epidemiology of Allergy: Natural Course and Risk Factors of Allergic Diseases. In: Traidl-Hoffmann, C., Zuberbier, T. and Werfel, T., Eds., *Allergic Diseases—From Basic Mechanisms to Comprehensive Management and Prevention*, Springer, 21-27. https://doi.org/10.1007/164_2021_507

[18] Vassilopoulou, E., Skypala, I., Feketea, G., Gawlik, R., Dunn Galvin, A., Meyer, R., *et al.* (2021) A Multi-Disciplinary Approach to the Diagnosis and Management of Allergic Diseases: An EAACI Task Force. *Pediatric Allergy and Immunology*, **33**, e13692. https://doi.org/10.1111/pai.13692

[19] Hossny, E., El-Sayed, S. and Abdul-Rahman, N. (2014) Sensitivity to Five Types of House Dust Mite in a Group of Allergic Egyptian Children. *Pediatric Allergy, Immunology, and Pulmonology*, **27**, 133-137. https://doi.org/10.1089/ped.2014.0333

[20] Ade, S. (2019) Cutaneous Sensitizations and Allergies to House Dust Mites among Adults Patients with Rhinitis or Asthma Followed at Parakou in the North of Benin. *Journal of Functional Ventilation and Pulmonology*, **10**, 26-31. https://doi.org/10.12699/jfvpulm.10.31.2019.26

[21] Thermo Fisher Scientific (2025) Allergen Encyclopedia: D73 Glycyphagus Domesticus. https://www.thermofisher.com/phadia/us/en/resources/allergen-encyclopedia/d73.html

[22] Lu, M.Y., Shobnam, N., Livinski, A.A., Saksena, S., Salters, D., Biete, M., *et al.* (2024) Examining Allergy Related Diseases in Africa: A Scoping Review Protocol. *PLOS ONE*, **19**, e0297949. https://doi.org/10.1371/journal.pone.0297949

[23] Halken, S., Larenas-Linnemann, D., Roberts, G., Calderón, M.A., Angier, E., Pfaar, O., *et al.* (2017) EAACI Guidelines on Allergen Immunotherapy: Prevention of Allergy. *Pediatric Allergy and Immunology*, **28**, 728-745. https://doi.org/10.1111/pai.12807

[24] Ring, J., Beyer, K., Biedermann, T., Bircher, A., Fischer, M., Fuchs, T., *et al.* (2021) Messages for Patients and Relatives from the 2021 Update of the Guideline on Acute Therapy and Management of Anaphylaxis. *Allergo Journal International*, **30**, 243-248. https://doi.org/10.1007/s40629-021-00185-3

[25] Dassé, S.R., Siransy, K.L., N'Guessan, K., Adou, A.H., Yeboah, O.R., Assi, A.U.A., *et al.* (2023) Évaluation de l'efficacité de l'Omalizumab dans l'asthme persistant sévère non contrôlé d'origine allergique en contexte de polysensibilisation allergénique. *Revue Algérienne d'Immunologie et d'Allergologie*, **8**, 9-17.

[26] Dinardo, G., Chiera, F., Arasi, S., Giannetti, A., Caimmi, D., Mastrorilli, C., *et al.* (2025) Allergy Skin Tests: An Update on Skin Prick Test and Prick to Prick. *Italian Journal of Pediatric Allergy and Immunology*, **39**, 26-34. https://doi.org/10.53151/2531-3916/2025-1109

[27] Muraro, A., Worm, M., Alviani, C., Cardona, V., DunnGalvin, A., Garvey, L.H., *et al.* (2021) EAACI guidelines: Anaphylaxis (2021 Update). *Allergy*, **77**, 357-377. https://doi.org/10.1111/all.15032

[28] Santos, A.F., Riggioni, C., Agache, I., Akdis, C.A., Akdis, M., Alvarez-Perea, A., *et al.* (2023) EAACI Guidelines on the Diagnosis of IgE-Mediated Food Allergy. *Allergy*, **78**, 3057-3076. https://doi.org/10.1111/all.15902

[29] Association Nationale de Formation Continue en Allergologie (ANAFORCAL) and Fédération ANAFORCAL Internationale (2021) Allergologie Pratique. https://www.abeforcal.org/wp-content/uploads/2021/06/AP137DEF.pdf

[30] Stróżek, J., Samoliński, B., Kłak, A., Gawińska-Drużba, E., Izdebski, R., Krzych-Fałta,

E., *et al.* (2019) The Indirect Costs of Allergic Diseases. *International Journal of Occupational Medicine and Environmental Health*, **32**, 281-290. https://doi.org/10.13075/ijomeh.1896.01275

[31] Licona-Limón, P., Kim, L.K., Palm, N.W. and Flavell, R.A. (2013) TH2, Allergy and Group 2 Innate Lymphoid Cells. *Nature Immunology*, **14**, 536-542. https://doi.org/10.1038/ni.2617

[32] Ogulur, I., Mitamura, Y., Yazici, D., Pat, Y., Ardicli, S., Li, M., *et al.* (2025) Type 2 Immunity in Allergic Diseases. *Cellular & Molecular Immunology*, **22**, 211-242. https://doi.org/10.1038/s41423-025-01261-2

[33] Palomares, O. (2013) The Role of Regulatory T Cells in IgE-Mediated Food Allergy. *Journal of Investigational Allergology and Clinical Immunology*, **23**, 371-382.

[34] Dzidic, M., Boix-Amorós, A., Selma-Royo, M., Mira, A. and Collado, M.C. (2018) Gut Microbiota and Mucosal Immunity in the Neonate. *Medical Sciences*, **6**, Article 56. https://doi.org/10.3390/medsci6030056

[35] Pascal, M., Perez-Gordo, M., Caballero, T., Escribese, M.M., Lopez Longo, M.N., Luengo, O., *et al.* (2018) Microbiome and Allergic Diseases. *Frontiers in Immunology*, **9**, Article 1584. https://doi.org/10.3389/fimmu.2018.01584

[36] Losol, P., Sokolowska, M., Hwang, Y., Ogulur, I., Mitamura, Y., Yazici, D., *et al.* (2023) Epithelial Barrier Theory: The Role of Exposome, Microbiome, and Barrier Function in Allergic Diseases. *Allergy, Asthma & Immunology Research*, **15**, 705-724. https://doi.org/10.4168/aair.2023.15.6.705