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Research Article

Impact of Latex Sensitization on Asthma and Rhinitis Progression: A Study at Abidjan-Cocody University Hospital - Côte d'Ivoire (*Progression of Asthma and Rhinitis related to Latex Sensitization*)

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Summary

Background: The frequency of latex allergy is increasing, posing a major health problem. This increase is related to the widespread use of latex materials and cross-reactions between latex proteins and certain foods. This cross-reactivity makes latex avoidance difficult, and latex sensitization is likely to worsen atopic conditions.

Objective: The authors evaluated the role of latex sensitization in the poor control of asthma and rhinitis.

Methodology: An analytical cross-sectional study was conducted on 1860 patients of all ages and genders, followed up for allergic asthma and rhinitis since March 2012 in the Immuno-Allergology Unit of the Cocody University Hospital in Abidjan. Prick tests with native extracts and the European standard battery were performed to identify allergenic sensitization. The impact of latex sensitization on asthma and rhinitis control was assessed by calculating odds ratios.

Results: A high frequency of latex sensitization was associated with asthma and rhinitis. The risks of poor control were related to monosensitization to latex and were even higher in the context of polysensitization.

Conclusion: The impact of latex sensitization on the progression of asthma and rhinitis has been well demonstrated. It is recommended to integrate the latex sensitization status into the therapeutic management strategy of these two pathologies.

More Information

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Background

The sap of the *Hevea brasiliensis* tree, also called latex, is natural rubber. It is a source of ubiquitous allergenic proteins which are included in the composition of many currently used products [1-3].

These proteins are frequently associated with allergic reactions much more in the form of type I hypersensitivity IgE-mediated than type IV [4].

Latex allergy has significantly increased worldwide, likely due to widespread latex product use and other factors since the first cases were described in Europe in 1927 [2,3,5-8].

Despite efforts to mitigate the consequences of latex allergy, it has become a major health problem [4].

In developing countries context, the lack of epidemiological data is associated with the low level of education in the general population, poorly informed about this health problem. Therapeutic management is more difficult since latex is the cause of the cross allergy [9,10].

In Côte d'Ivoire, the use of latex-based products and plant foods clinical cross-reactivity with latex [1,4,9,10], could make eviction procedure extremely difficult. In such a context, allergenic sensitization to latex could have an impact on the evolution of atopic pathology. This study aimed to evaluate

the role of latex sensitization in the worsening of asthma and rhinitis.

Methods

The authors performed a cross-sectional study with the analytical aim of 1860 patients aged from 2 to 68 years old. Without sex consideration, patients were followed up from March 2012 to February 2024, in the Immuno-Allergology Unit of Cocody University Hospital, for allergic manifestations management.

Clinical examination and Prick tests using either native extracts or the European standard battery have been performed to classify the patients. As it is shown in the flow chart (Figure 1), patients were divided into a "sensitized group (*latex-mono and poly-sensitized persons*)" and a "non-sensitized group".

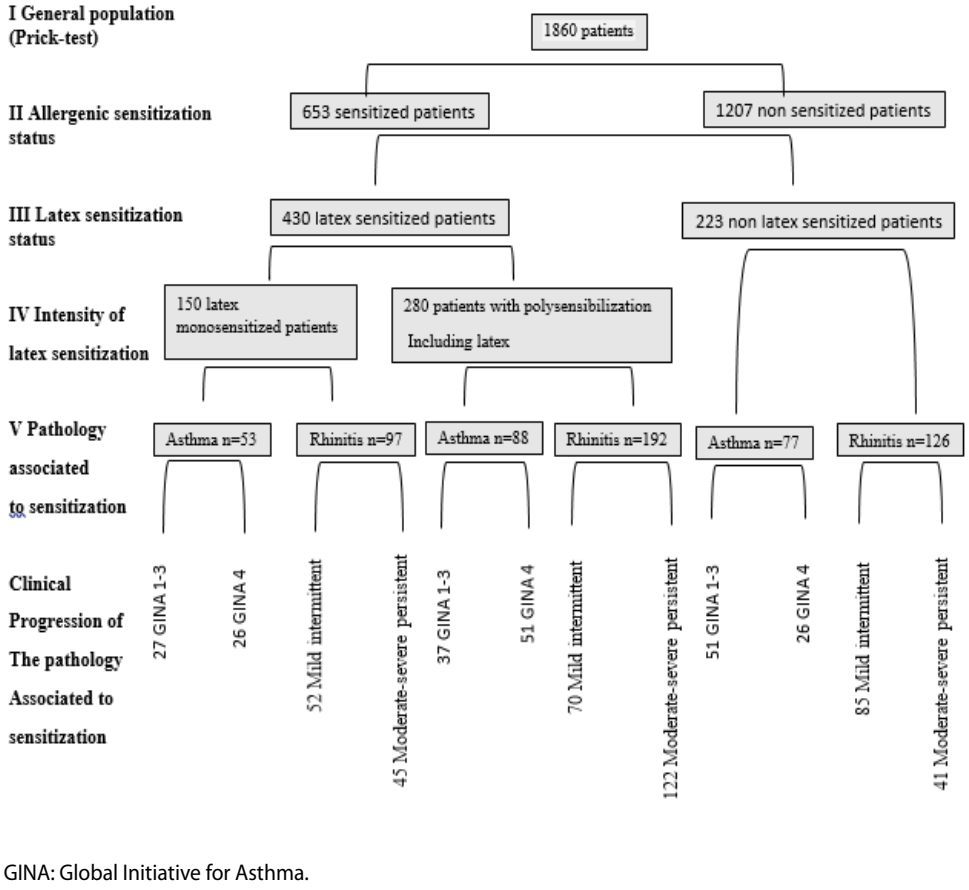
The flowchart in Figure 1 presents the successive steps in patient selection. In a study of 1,860 patients, prick tests revealed that 653 were sensitized to allergens, while 1,207 were not. Among the sensitized patients, 430 reacted to latex, and 223 to other allergens. The 430 latex-reactive patients were further divided based on the intensity of sensitization: 150 were monosensitized to latex, and 280 were polysensitized to various allergens, including latex. These patients were then categorized by pathology: 53 asthma patients were monosensitized to latex, while 88 were polysensitized. Similarly, 97 rhinitis patients were monosensitized, and 192 were polysensitized. Among the non-sensitized group, 77 had asthma, and 126 had rhinitis. Finally, all patients were classified by severity: asthma patients were staged according to GINA guidelines (stages 1-3), and rhinitis patients were classified per ARIA (Allergic Rhinitis and its Impact on Asthma) guidelines into Mild Intermittent and Moderate-Severe Persistent stages.

On the other hand, asthma patients were classified into the "*Asthma Group*," subdivided according to the GINA guidelines [11] into "*stages 1-3*" and "*stages 4-5*". Rhinitis patients, called "*Rhinitis Group*," were subdivided according to ARIA guidelines [12] into "*mild intermittent*" and "*moderate-severe persistent*." The impact of latex sensitization on the control of these two affections was assessed by calculating the odds ratio.

Results

Frequency of allergenic sensitization in the general population followed up.

The pie chart in Figure 2 illustrates the distribution of allergenic sensitization status among patients monitored in the Allergy Unit. Out of 1860 patients, 653 (35%, highlighted in blue) were sensitized to various allergens, including latex.



GINA: Global Initiative for Asthma.

Figure 1: Flowchart depicting the various stages of patient selection.

Latex sensitization

Of the 653 sensitized patients, 430 (66,10 %) are sensitized to latex. Additionally, 33,90 % (n = 223) exhibit sensitization to allergens other than latex. On one hand, a total of 141 patients suffering exclusively from asthma showed either monosensitization to latex (n = 53) or polysensitization to latex-associated allergens (n = 88). On the other hand, 289 patients suffering exclusively from allergic rhinitis exhibit monosensitization to latex (n = 97) or polysensitization to latex-associated allergens (n = 192).

Impact of latex sensitization

The text outlines the impact of latex-allergenic sensitization on asthma and rhinitis progression. Table 1 summarizes these effects. Table 1a-1c compares monosensitization to latex with allergenic sensitization without latex in worsening asthma and rhinitis. Table Ia1 details the risk of asthma progression from grades 1-3 to grade 4 per GINA guidelines, while Table 1a2 covers the risk of rhinitis progression from mild intermittent to moderate severe per ARIA guidelines. Table 1b assesses polysensitization, including latex, against sensitization without latex, with similar evaluations in Tables 1b1 and 1b2 Lastly, Table 1c(1-2) compares allergenic polysensitization involving latex to monosensitization. Odds ratios indicate that monosensitization to latex increases the risk of asthma (1.9) and rhinitis (1.32) progression. Polysensitization, including latex, significantly raises the risk, with asthma at 2.7 and rhinitis at 3.6. Polysensitization also affects clinical progression, with odds ratios of 1.4 for asthma and 2 for rhinitis.

Discussion

Prevalence of allergies and allergenic sensitization

The prevalence of allergic diseases is increasing in developed countries [13-15]. Concerning allergenic sensitization, its prevalence is just under 55% among adults in the USA [16].

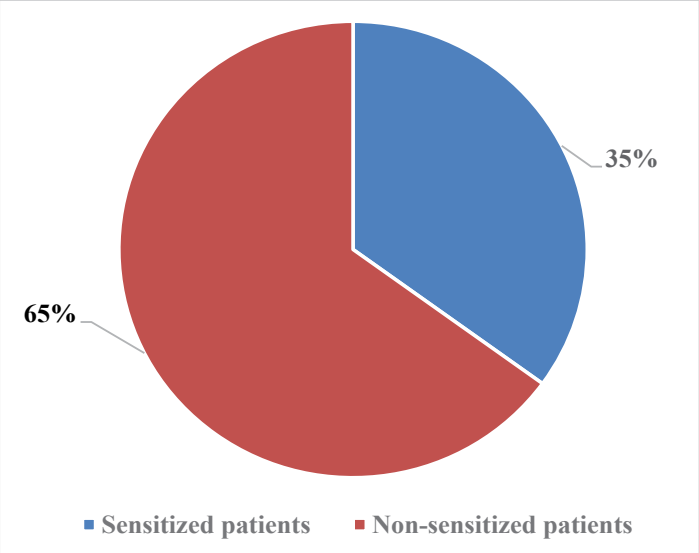


Figure 2: Distribution of the patient population monitored in the Immuno-Allergology Unit, based on allergenic sensitization status.

In Sub-Saharan Africa, Agodokpessi, et al. in Benin, and NGOM, et al. in Ivory Coast both noted a high frequency of sensitization. The grouped results regarding sensitization to aeroallergens among patients suffering from asthma and rhinitis in the two countries are indicated below: mites (99.6%), cockroaches (71.3%), *Alternaria alternata* (71%), dog and cat (68%) [17,18].

In our series, out of 1860 patients, 653 (35%, highlighted in blue slice – Figure 2) are sensitized to allergens such as mites, crustaceans, fruits, and latex. Latex sensitization: Latex sensitization was higher (66%) among sensitized patients in the study population (Figure 3). This high frequency is related to the widespread and increasing use of latex-based products.

This argument is further supported by numerous other factors. Indeed, chronic exposure to latex is a contributing factor to sensitization, as reported by West R W [19]. In our series, approximately 15% of patients work in professions known to be at risk (healthcare personnel) [19], rubber field workers) [20], where exposure to latex products (gloves) and the sap of *Hevea brasiliensis* is constant. Additionally, Ivorians are reputed consumers of bananas and avocados, two fruits with allergens that cross-react with latex.

Impact of latex sensitization on the progression of asthma and rhinitis

In the pathophysiology of allergy, the sensitization phase plays a crucial role in specific reactivities. Repeated exposure to the allergen often raises the hypothesis of the impact that this sensitization may have on the clinical progression of allergic diseases. Asthma specialists frequently report other predictive factors of severity beyond allergic sensitization. These include passive smoking, early onset of wheezing, the number of hospitalizations due to exacerbations, and the presence of aggravating factors [21-23], as well as comorbidities [24].

Regarding allergic sensitization, more and more authors are identifying it as a factor influencing the severity of respiratory atopic diseases. Indeed, it has been reported that polysensitization, particularly to dust mites, strongly influences the worsening of allergic rhinitis and conjunctivitis in children [25]. The predominant role of indoor allergen sensitization has also been well documented in the worsening of asthma in children, the majority of whom are sensitized to indoor allergens [26].

The phenomenon of continuous exposure to allergens certainly plays a key role, as was observed during the COVID-19 pandemic with periods of lockdown [27]. This is particularly noticeable with recurrent exposure to latex in high-risk professions, such as healthcare workers and those

Table 1: Impact of latex sensitization on the progression of asthma and rhinitis.

Ia. Latex monosensitization versus Allergenic sensitization without latex on Asthma Ia.1 and Rhinitis Ia.2 progression									
Ia.1 ASTHMA	OR = 1,9	Latex monosensitization	Sensitization without latex	Total	Ia.2 RHINITIS	OR=1,32	Latex monosensitization	Sensitization without latex	Total
	GINA 4	26	26	52		Moderate To severe	45	41	86
	GINA 1 - 3	27	51	78		Mild intermitent	52	85	137
	TOTAL	53	77	130		TOTAL	97	126	223
Ib. Allergenic polysensitization including latex versus allergenic sensitization without latex on asthma Ib.1 and rhinitis Ib.2 progression									
Ib.1 ASTHMA	OR = 2,7	Allergenic Polysensitization Including latex	Sensitization without latex	Total	Ib.2 RHINITIS	OR=3,6	Allergenic Polysensitization Including latex	Sensitization without latex	Total
	GINA 4	51	26	77		Moderate To severe	122	41	163
	GINA 1 - 3	37	51	88		Mild intermitent	70	85	155
	TOTAL	88	77	165		TOTAL	192	126	318
Ic.Allergenic polysensitization including latex versus latex monosensitization on asthma Ic.1 and rhinitis Ic.2 progression									
Ic.1 ASTHMA	OR=1,4	Allergenic Polysensitization Including latex	Latex monosensitizat	Total	Ic.3 RHINITIS	OR=2	Allergenic Polysensitization Including latex	Latex monosensitization	Total
	GINA 4	51	26	77		Moderate To severe	122	45	167
	GINA 1 - 3	37	27	64		Mild intermitent	70	52	122
	TOTAL	88	53	141		TOTAL	192	97	289

OR: Odds Ratios.

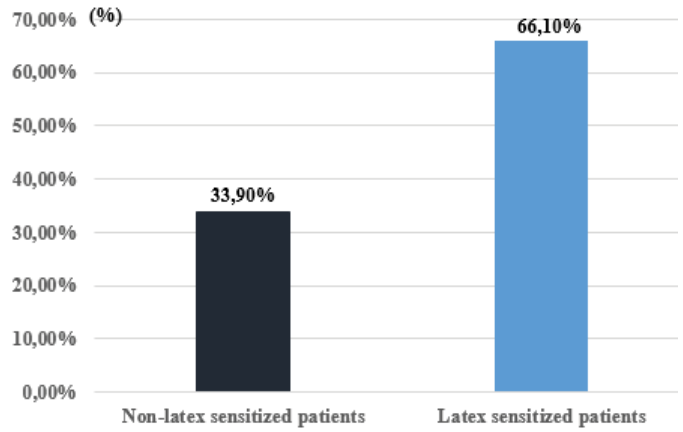


Figure 3: Distribution of patients based on latex sensitization.

involved in natural rubber production [1]. Furthermore, the specific characteristic of latex lies in its cross-reactivity with food allergens, which gives this allergen a ubiquitous nature, simulating recurrent contact with the patient. In a 2002 systematic review, James Fish highlighted that occupational exposure to Natural Rubber Latex (NRL) in healthcare workers can cause rhinitis and conjunctivitis symptoms. However, the risk and prevalence of NRL-induced asthma remain low due to the large size of the allergens, which prevents them from easily entering the lower airways [28].

While the link between latex sensitization and allergic pathology is reported how this sensitization may impact the progression of asthma and rhinitis remains to be demonstrated.

The authors have shown that progression to stage 4 GINA guidelines is influenced by monosensitization to latex despite good adherence to treatment (Table 1).

The risk is even higher when latex sensitization is associated with other allergens. The same observation is reported in the progression of allergic rhinitis, where the transition from intermittent to moderate-severe persistent stages was influenced by strong latex sensitization.

Continuous contact with latex-based products is the cause. In Côte d'Ivoire, despite the decree banning the use of plastic bags [29,30], there is a high usage of these products by the general population. Indeed, the population seems to be poorly informed about the consequences of allergic pathology. The impact on the occurrence and worsening of allergic manifestations to latex is not sufficiently highlighted. This is partly due to the lack of epidemiological data in this resource-limited country context.

Conclusion

Latex allergy is due to a strong allergenic sensitization associated with manifestations of asthma and rhinitis. It is a major public health issue. Sensitization to latex is well demonstrated as a risk factor for the worsening of these two pathologies. The role of latex in cross-allergies is certainly the

cause of the difficulty in implementing avoidance procedures. Therefore, data on latex sensitization should be integrated into the management strategy for asthma and rhinitis.

Highlights of this article

- The increasing prevalence of latex sensitization complicates latex avoidance.
- Latex sensitization strongly impacts asthma and rhinitis control, especially in polysensitization.
- Incorporate latex sensitization status into asthma and rhinitis management strategies.

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Ethical considerations

All patients gave their informed consentment for the publication of anonymous data and the study benefited from the agreement of the Medical and Scientific Department of the University Hospital of Cocody (CHU Cocody under the N°.007-12/MSHPCMU/CHU-C/DMS/cm.

Author contribution

Dasse SR designed the study; Dasse SR, Siransy KL, Yeboah OR, and Adou AH acquired, analyzed, and interpreted data; Dasse SR and Nguessan K drafted the article. Adou AH, Kouacou Amah VP, Assi AUA, Siransy KL, Séri YJ, Moussa S, Oura D, Memel CL, Koya H, Attoukoula LA revised it critically for important intellectual content. All authors approved the final version to be submitted and agreed to be accountable for all aspects of the work.

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