

Research Fellow ISAD Application Project (3 Months)

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Project Title

"Association of Environmental Ecological Variables with the Incidence of Atopic Dermatitis in France"

Theoretical Framework

Atopic dermatitis is a chronic inflammatory skin disease, classically developing in childhood although can persist or manifest for the first time in adulthood. (1) The prevalence of this disease is close to 10%, regardless of age, but it has been observed that both prevalence and severity tend to decrease with age. (2)

However, it has been observed globally that estimated prevalences of atopic dermatitis have a tendency to increase, and this trend is likely due to changes in urbanization and environmental factors. (3)

Atopic dermatitis develops from the interaction between genetic predisposition and environmental risk factors. These environmental factors are precisely what we can intervene and could dramatically change the incidence of the disease or its prognosis.

Among the environmental factors that have been described, we can find latitude, smoking, and water hardness. (4)

- Latitude has been widely described as a variable associated with the development of various immune-mediated diseases. Higher latitudes near the equator, and therefore higher levels of ultraviolet radiation, are inversely associated with the prevalence of atopic dermatitis. (5) This is probably because latitude is an intermediate variable between radiation and vitamin D synthesis. It has been described that vitamin D has multiple functions in immunity and could therefore play a role in the development or prognosis of immune-mediated diseases.
- On the other hand, smoking has an effect on both humoral and cellular immunity. However, the results regarding the association between smoking and atopic dermatitis have not been consistent. There is evidence from a systematic review and meta-analysis that there could be a significant association between atopic dermatitis and exposure to smoking (active, passive or during pregnancy) in childhood. (6)

- Finally, water hardness has been described as an environmental risk factor for the development and exacerbation of atopic dermatitis. Rainwater is normally soft but tends to incorporate several minerals in different concentrations that vary geographically, which increases its hardness. (7) The effects of water hardness have been evaluated for various health conditions: cardiovascular diseases, growth retardation, and infertility. (4) A recent systematic review and meta-analysis found a significant association between living in areas where water is harder and the development of atopic dermatitis in children. (7)

Demonstrating the association and its intensity between environmental variables and atopic dermatitis is challenging because the measurement of such exposures is complex. To achieve this goal, ecological studies are used in epidemiology. Ecological studies evaluate variables that are measured at a population level (not individually), such as latitude, regional water hardness concentration, rates of smoking prevalence, and rates of incidence or prevalence of atopic dermatitis by region.

Ecological studies are the most appropriate studies, especially if we want to accomplish changes in health policies. Despite the potential for “ecological fallacy” when attributing exposure to a population, it is important to consider that ecological studies remain useful because aggregating exposure at the population level serves as an instrumental variable where individual exposures may be confounded by unmeasured variables. (8)

Main Objective

To evaluate the ecological association between population-based variables and atopic dermatitis in France.

Specific Objectives

- a. To assess the association between latitude (an intermediate variable for ultraviolet radiation) in different regions of France and the incidence of atopic dermatitis.
- b. To assess the association between water hardness levels in different regions of France and the incidence of atopic dermatitis.
- c. To assess the association between the prevalence of smoking in different regions of France and the incidence of atopic dermatitis.
- d. To calculate the strength of the association between these ecological variables and atopic dermatitis.

Hypothesis

"The incidence of atopic dermatitis is significantly associated with ecological variables such as latitude, water hardness, and smoking prevalence in France."

Methodology

Design: Cross-sectional ecological study
Location: Centre Hospitalier Universitaire (CHU) Rennes, Francia
Timeframe: The study will be conducted between May and July 2024 (3 months)
Data Sources:

1. Medical administrative database of the atopic dermatitis study group of the French Society of Dermatology [and Constances cohort \(www.constances.fr\)](http://www.constances.fr)
2. Ministère de la Santé et de la Prévention. Qualité de l'eau potable, (September 23rd, 2023) <https://sante.gouv.fr/sante-et-environnement/eaux/eau>
3. Santé publique. Bulletin épidémiologique. (September 23rd, 2023) http://beh.santepubliquefrance.fr/beh/2022/26/2022_26_1.html
4. Global solar analysis. (September 23rd, 2023) <https://globalsolaratlas.info/download/france>

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8. Loney T, Nagelkerke NJ. The individualistic fallacy, ecological studies and instrumental variables: a causal interpretation. *Emerg Themes Epidemiol*. 2014 Nov 19;11:18. doi: 10.1186/1742-7622-11-18.