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ORIGINAL ARTICLE

Study of Filaggrin Gene Mutation in Patients with Atopic Dermatitis

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ABSTRACT
Atopic dermatitis (AD) is a chronic inflammatory skin disease characterized by impaired barrier function of the skin and increased immune responses. A mutation of the filaggrin (FLG) gene, which plays an important role in maintaining the structural integrity and hydration of the skin, has been identified as an important genetic factor contributing to the development of blood pressure. This study examines the prevalence of mutations in the FLG gene in patients diagnosed with atopic dermatitis and their relationship to the severity of the disease and clinical manifestations. Through a comprehensive analysis of genetic data and clinical maps, this study highlights the impact of FLG gene mutations on the pathophysiology of blood pressure. In addition, the results obtained are aimed at developing targeted therapeutic strategies and improving personalized patient management. The study also analyzes the existing literature to provide a comprehensive understanding of the role of FLG gene mutations in the development of atopic dermatitis in various populations.
Keywords: *Atopic dermatitis, filaggrin gene, genetic mutations, skin barrier dysfunction, eczema, personalized medicine, genetic predisposition.*

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INTRODUCTION

Atopic dermatitis (AD) is a multifactorial skin disease that affects approximately 15-20% of children and 1-3% of adults worldwide, with a higher prevalence in industrialized countries [6]. It is a chronic inflammatory disease characterized by severe itching, dry skin and a recurrent course. The pathogenesis of AD is complex and involves a combination of genetic, environmental, and immunological factors [1]. Among them, genetic predisposition plays a key role, with mutations in the filaggrin (FLG) gene becoming a significant risk factor for the onset and severity of the disease.

The FLG gene encodes filagrin, the most important structural protein responsible for the aggregation of keratin filaments in the epidermis to maintain the barrier function of the skin [3]. Filagrin also promotes the formation of natural moisturizing factors (NMF), which are necessary for skin hydration and pH regulation. Mutations in the FLG gene lead to a loss of the functional phenotype, disrupting the skin barrier and increasing transepidermal water loss (TEPW). This disorder promotes the penetration of allergens, microbial colonization, and inflammatory reactions, which are hallmarks of blood pressure [5].

Several studies have established a close relationship between FLG mutations and BP. For example, Palmer *et al.* [6] first identified two common FLG mutations, R501X and 2282del4, in European populations, reporting that these mutations increase the risk of developing blood pressure by 3-4 times. Subsequent studies extended these results to other populations, revealing significant ethnic differences in the prevalence and types of FLG mutations [3]. Additional mutations such as 3321delA and K4671X have been identified in East Asian populations, highlighting the genetic diversity underlying AD [4].

Interestingly, FLG mutations are associated not only with AD, but also with concomitant atopic disorders such as asthma and allergic rhinitis, a phenomenon known as the "atopic march" [7]. This highlights the systemic consequences of impaired skin barrier function and the critical role of filaggrin in maintaining immune homeostasis.

MATERIAL AND METHODS

This study uses a systematic and comprehensive methodology to study the role of filaggrin (FLG) gene mutations in patients with atopic dermatitis (AD). The methodology combines both qualitative and quantitative approaches to provide a deep understanding of the prevalence, clinical consequences, and potential therapeutic effects of FLG mutations in the case of AD. The following sections describe the key steps and procedures used in this study:

1. Research design

This study uses a cross-observation method to analyze the relationship between mutations in the FLG gene and the clinical manifestations of atopic dermatitis. This method was chosen to enable simultaneous collection and analysis of data on genetic mutations and clinical characteristics, which provides insight into the relationship.

2. The study population

The study included patients with a diagnosis of atopic dermatitis, established in accordance with the criteria of the American Academy of Dermatology (AAD). Participants were selected from dermatology clinics and hospitals in urban and rural areas to ensure a diverse sample. The inclusion and exclusion criteria are listed below:

Inclusion criteria:

- Patients diagnosed with AD by a dermatologist.
- Age from 5 to 50 years.
- Willingness to provide written informed consent for genetic research.

Exclusion criteria:

- Patients with other skin diseases that can mimic blood pressure (for example, psoriasis, contact dermatitis).
- Individuals who have received systemic immunosuppressive therapy in the last three months.

A total of 300 patients were included in the study, distributed by age, gender, and geographical location to ensure a representative sample.

3. Qualitative analysis

- SWOT analysis: A SWOT analysis was conducted to assess the strengths, weaknesses, opportunities, and threats associated with the introduction of FLG mutation screening into clinical practice.
- Comparative review: The results were compared with existing studies conducted in other population groups in order to contextualize the results in a global framework.

RESULTS AND DISCUSSION

1. The prevalence of mutations in the Filagrin gene in the study population:

The main purpose of this study was to study the prevalence of mutations in the filagrin (FLG) gene in patients diagnosed with atopic dermatitis (AD). A total of 300 people aged 5 to 50 years were included in the study. These participants were sorted by age group, gender, and geographical location to ensure that the sample was representative. Of the 300 participants, 145 (48.3%) had at least one type of FLG mutation, indicating a significant correlation between mutations in the FLG gene and the incidence of blood pressure.

The specific mutations identified in this group corresponded to known BP-related mutations such as R501X, 2282del4, and 3321delA mutations, which are often associated with impaired skin barrier function. Of the participants with FLG mutations, 68% were carriers of the R501X mutation, and 25% had the 2282del4 mutation. These results are consistent with previous studies that reported a high prevalence of FLG mutations in populations with AD [5, 9, 10]. The remaining 7% of patients had less common mutations, such as K4671X, which have been less thoroughly studied, but have also been found to affect the clinical severity of BP.

Interestingly, the prevalence of FLG mutations was higher in individuals with more severe forms of BP. This finding indicates a potential link between mutations in the FLG gene and exacerbation of clinical symptoms, which is consistent with the results of other studies that have reported a significant association between mutations in the FLG gene and the severity of blood pressure [8].

2. Clinical manifestations of atopic dermatitis due to FLG mutations

The clinical manifestations of atopic dermatitis have also been thoroughly studied in connection with FLG mutations. Among 145 participants with FLG mutations, 60% had moderate to severe blood pressure, according to the SCORAD index (assessment of atopic dermatitis). In contrast, only 20% of participants without any identified FLG mutations had moderate or severe blood pressure, suggesting that people with FLG mutations are at higher risk of developing more severe forms of the disease.

The most common clinical manifestations observed in patients with FLG mutations were intense xerosis (dry skin), itching, and chronic eczematous lesions. In addition, patients with mutations in both the R501X and 2282del4 genes had a higher incidence of concomitant diseases such as allergic rhinitis and asthma, which are commonly found in the atopic triad. These results are consistent with previous studies showing that FLG mutations are closely associated with a predisposition to atopic march, which includes the development of respiratory allergic diseases [11].

A noteworthy observation was that carriers of the mutation often showed a more pronounced violation of the skin barrier, as evidenced by a higher incidence of skin infections (for example, staphylococcus aureus) compared with non-carriers. This highlights the clinical importance of understanding the genetic basis of BP for better treatment and prediction of the course of the disease.

3. The effect of FLG mutations on therapeutic approaches

Therapeutically, patients with FLG mutations reacted differently to traditional BP treatments such as topical corticosteroids and emollients. However, it has been found that patients with a history of severe blood pressure and documented FLG mutations benefit significantly from new treatments aimed at restoring the skin barrier, such as topical moisturizers containing ceramides and new biologics such as dupilumab, which has shown efficacy in patients with FLG mutations [12].

In contrast, patients without FLG mutations seemed to respond better to standard corticosteroid treatment, and they experienced fewer exacerbations. These observations suggest that therapeutic strategies for AD can be adapted based on genetic screening, especially in individuals with FLG mutations who may need more aggressive treatment of skin conditions to prevent complications [13].

4. SWOT analysis of FLG mutation screening results in clinical practice

To assess the implementation of FLG mutation screening in clinical practice, a SWOT analysis (strengths and weaknesses, opportunities and threats) was conducted. The results of this analysis revealed several key points:

Strengths: Screening of FLG mutations can provide an objective genetic basis for the diagnosis of blood pressure, especially in complex cases. Early detection of FLG mutations may allow the development of customized therapeutic approaches that improve treatment outcomes for patients, especially those with severe disease. The ability to predict the severity of the disease can reduce healthcare costs by preventing unnecessary treatment in mild cases.	Weaknesses: The high cost of genetic testing may limit its availability, especially when resources are scarce. The need for specialized genetic consultants to interpret the results may create logistical obstacles to widespread adoption.
Opportunities: The integration of genetic testing into routine dermatological practice may lead to personalized treatment approaches that enhance the effectiveness of treatment. A deeper understanding of genetic factors may encourage the development of new treatments aimed at addressing the underlying cause of blood pressure, rather than simply eliminating symptoms.	Threats: The ethical aspects of genetic testing must be carefully considered, including privacy issues and potential discrimination based on genetic information. The clinical significance of FLG screening for predicting treatment response may require further confirmation, as not all patients with FLG mutations respond in the same way.

Table 1. SWOT analysis of FLG mutation screening results in clinical practice

This analysis shows that, despite the significant benefits of introducing FLG mutation testing into clinical practice, high cost and ethical considerations may pose challenges that need to be addressed through health policy reform.

5. Comparative review with existing literature

The results of this study were compared with existing studies conducted in other populations to interpret the results in a broader context. Similar studies conducted in European and East Asian populations consistently indicate a high prevalence of FLG mutations in patients with AD, especially in those with severe manifestations of the disease [9, 11]. However, the mutation rate identified in this study (48.3%)

was slightly higher than in Western populations, possibly due to geographical or ethnic differences in the genetic stock.
Interestingly, comparative analysis with studies conducted in developing countries has shown a lower prevalence of FLG mutations, suggesting that environmental factors such as exposure to allergens and environmental pollution may also play a significant role in the development and severity of blood pressure [7].

CONCLUSION

This study highlights the significant association between FLG gene mutations and the clinical manifestations of atopic dermatitis. The results obtained emphasize the importance of genetic research for predicting the severity of the disease and developing treatment strategies for patients with atopic dermatitis. In addition, the results suggest that screening for FLG mutations can play a crucial role in individualizing therapy, especially in severe cases. However, issues related to the cost, accessibility, and ethical considerations of genetic testing need to be addressed in order to fully integrate FLG screening into routine clinical practice.
Overall, this study contributes to the expansion of knowledge about the genetic basis of atopic dermatitis and provides valuable information about the potential benefits of genetic testing to improve clinical outcomes in patients with AD.

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