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Immune-Mediated Inflammatory Skin Disease in Middle Eastern and North African Populations: Atopic Dermatitis at the Intersection of Biology, Culture, and Structural Inequity

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Abstract

Atopic dermatitis (AD), a prototypical immune-mediated inflammatory disease, represents a growing and underrecognized public health burden among Middle Eastern and North African (MENA) populations. Global estimates suggest that AD affects more than 170 million individuals worldwide, with increasing prevalence in low- and middle-income regions undergoing rapid urbanization, including much of the MENA region. Despite this growing impact, MENA populations remain underrepresented in epidemiologic datasets and in the development of clinical trial guidelines. This narrative review examines current evidence on AD in MENA populations, integrating insights on epidemiology, immunopathogenesis, clinical phenotype, socio-cultural context, health system capacity, and geopolitical determinants. In addition to clinical and immunopathological considerations, particular emphasis is placed on unmet needs, quality-of-

life impact, and structural barriers to care. Gaining an understanding of these region-specific factors is essential for dermatologists caring for patients of MENA ancestry and for the development of equitable, context-sensitive management strategies.

Defining the Middle Eastern and North African Population

The term "Middle Eastern" is frequently used imprecisely in dermatologic literature, often conflating ethnicity, geography, religion, and culture. The Middle East and North Africa (MENA) region spans North Africa, the Levant, the Arabian Peninsula, and parts of Western Asia **(Figure 1)**, encompassing populations with substantial heterogeneity in genetic ancestry, skin phototype, climate exposure, and healthcare access **(Figure 2)**. In medical literature, individuals from this region are commonly misclassified as "White" or, more egregiously, "Caucasian," masking meaningful differences in disease burden and presentation. Similarly, "Arab" is a culturo-linguistic designation and should not be conflated with race, ancestry, or specific ethnicity.

Global dermatology research demonstrates that atopic dermatitis (AD) prevalence varies widely among populations sharing ancestry who live in differing environmental and socioeconomic contexts. This underscores the dominant influence of urbanization, environmental exposures, healthcare access, and ethnicity-context over ethnicity alone.[1-3] These findings highlight the limitations of extrapolating data derived from Western cohorts to MENA populations.

Epidemiology of Atopic Dermatitis in the MENA Region

AD prevalence is increasing across much of the MENA region, particularly within urban centres. Global Burden of Disease analyses indicate that approximately 171 million individuals worldwide were affected by AD in 2019, corresponding to just over 2% of the global population.[2] While

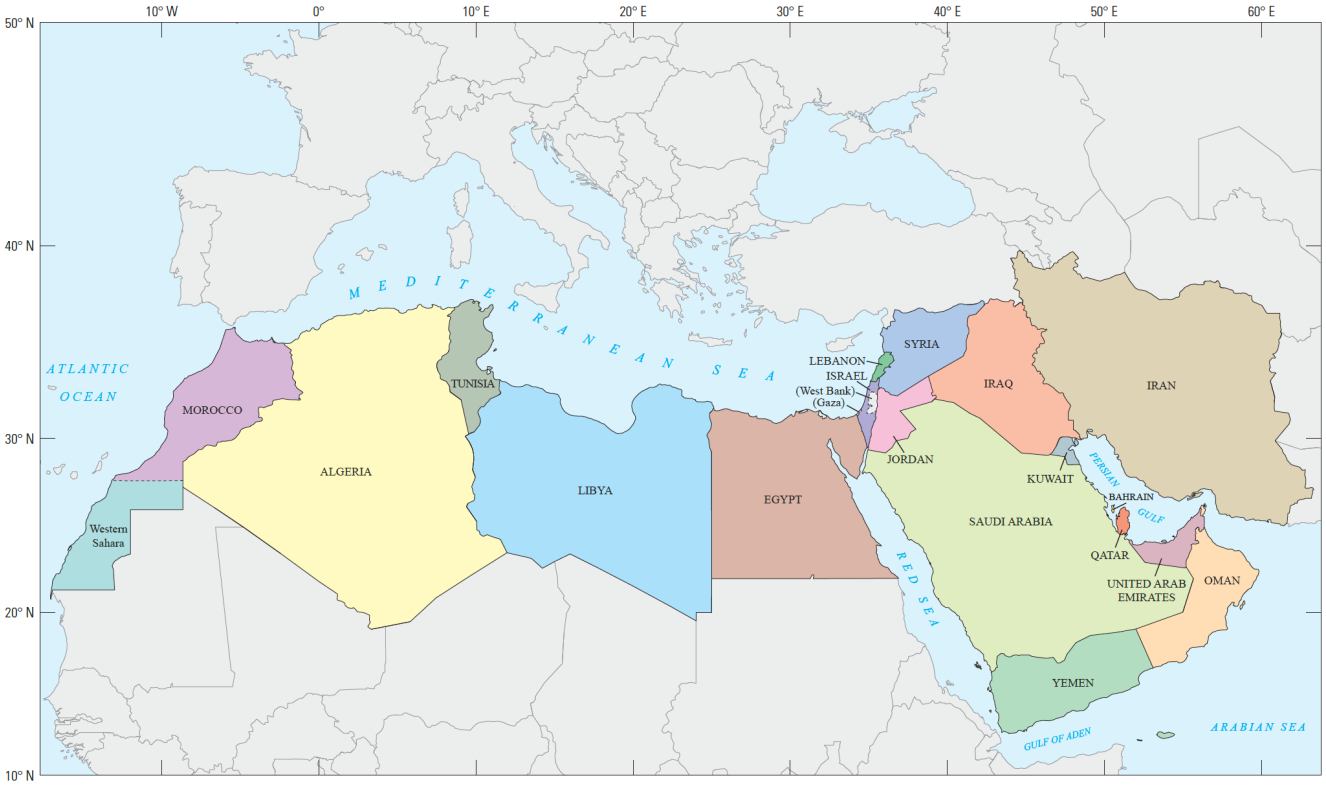

Figure 1. Map of the Middle East and North Africa region. 2015 Minerals Yearbook; *adapted from Taib M. 2015 Minerals Yearbook The Middle East and North Africa, 2019.*

age-standardized prevalence rates in the MENA region have remained relatively stable from 1990 to 2019, absolute case numbers and years lived with disability remain high, reflecting substantial population growth and demographic shifts.[6]

Country-level studies reveal marked heterogeneity in AD prevalence estimates. International Study of Asthma and Allergies in Childhood (ISAAC)-based surveys and multinational analyses report pediatric AD prevalence ranging from approximately 3–4% in Egypt to more than 15–20% in Saudi Arabia and the United Arab Emirates, depending on the diagnostic criteria applied **(Table 1)**.[7-9] Symptom-based prevalence estimates consistently exceed physician-diagnosed rates, reflecting underdiagnosis, limited access to dermatology specialists, and inconsistent diagnostic frameworks. Migration patterns and geopolitical instability add further complexity to epidemiologic interpretation, particularly in Gulf states where expatriate populations constitute the majority of residents.[9]

Clinical Presentation and Diagnostic Challenges

AD in MENA patients may present with features that exhibit subtle differences from classic descriptions based primarily on lighter skin phototypes. **(Figures 3, 4, and 5)** Erythema may be less apparent, presenting as violaceous or red-brown in patients with constitutively darker skin phototypes, leading to underestimation of disease severity. Features such as pronounced lichenification, follicular eczema, prurigo-like nodules, and extensive post-inflammatory hyperpigmentation may be more commonly

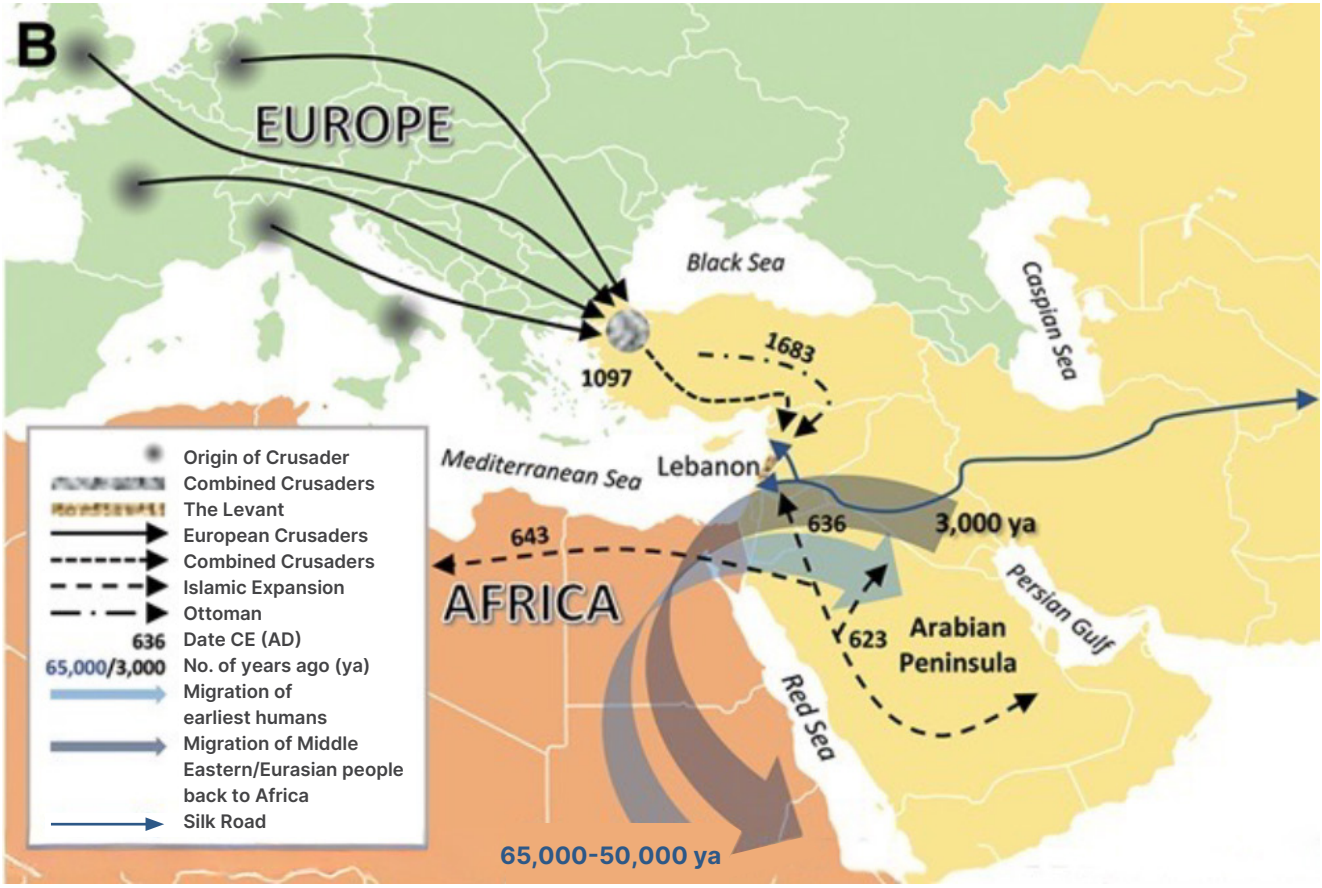

Figure 2. An overview of selected migration patterns that contributed to the ethnic origins of people in the Middle East; *adapted from Kashmar M, et al. Consensus Opinions on Facial Beauty and Implications for Aesthetic Treatment in Middle Eastern Women, 2019.*

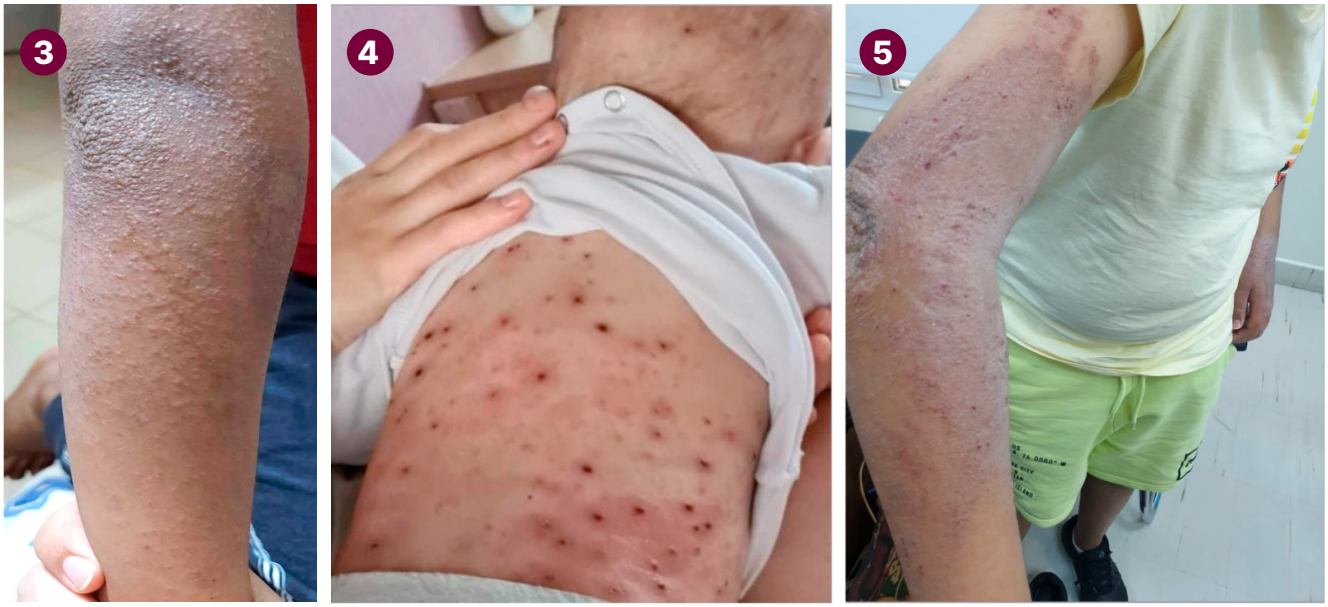

Figure 3. Hot, humid weather leading to exacerbation of AD with follicular or eczematized miliaria phenotypes; *from Mahmoud O, et al. Burden of Disease and Unmet Needs in the Diagnosis and Management of Atopic Dermatitis in the Arabic Population of the Middle East. Journal of Clinical Medicine. 2023*
Figure 4. Vaccination is not mandatory in much of the region (incl Egypt) so presentations like eczema herpeticum are more common; *from Mahmoud O, et al. Burden of Disease and Unmet Needs in the Diagnosis and Management of Atopic Dermatitis in the Arabic Population of the Middle East. Journal of Clinical Medicine. 2023*
Figure 5. Patients who are more melanized, tend to have more extensor than flexor involvement and may have more profound itch; *from Mahmoud O, et al. Burden of Disease and Unmet Needs in the Diagnosis and Management of Atopic Dermatitis in the Arabic Population of the Middle East. Journal of Clinical Medicine. 2023*

observed. Palmar hyperlinearity and ichthyosis vulgaris may be less prominent, emphasizing the importance of objective scoring.[9,10] These considerations may influence topical treatment selection, emphasizing early anti-inflammatory therapy paired with barrier repair to prevent flares.

Post-inflammatory hyperpigmentation is a major driver of patient distress and perceived disease burden despite "objective" improvement in clinical outcome measures such as Eczema Area and Severity Index (EASI) or SCORing Atopic Dermatitis (SCORAD). Post-inflammatory hyperpigmentation often persists long after inflammatory activity has resolved. Secondary infection remains common, particularly in settings of delayed diagnosis, limited access to topical therapies, or environmental heat.[11,12]

Immunopathogenesis: Genetics, Environment and the Microbiome

The immunologic underpinnings of AD in MENA populations are generally aligned with global patterns, characterized by Th2-skewed inflammation, epidermal barrier dysfunction, and neuroimmune dysregulation. However, as region-specific modifiers are elucidated, their influence appears increasingly important.

In MENA patients, AD shows genetic heterogeneity that may shape phenotype and complicate diagnostic evaluation. Loss-of-function (LoF) variants in the filaggrin gene (*FLG*), the strongest known single-gene risk factor for AD, are common in northern European cohorts but are rare in Middle Eastern populations and absent in most African populations, according to a large systematic review and meta-analysis.[13] Consequently, in MENA patients, barrier impairment may more commonly reflect inflammation-mediated downregulation of *FLG* rather than inherited *FLG* LoF mutations. Additional variation in type 2 signalling pathways (eg, interleukin -4 receptor alpha [IL4RA] and signal transducer and activator of transcription 6 [STAT6] polymorphisms described in Egyptian

children) may also contribute to disease susceptibility.[9]

When *FLG* LoF variants are present, they are associated with earlier disease onset and more persistent clinical course, supporting a lower threshold for early, proactive barrier repair efforts, infection prevention, and anti-inflammatory control.[10,14] Genotype-informed counselling may also aid in explaining and managing fluctuations in xerosis and recurrent flares despite treatment adherence.[10] From a therapeutic standpoint, clinical data indicates that dupilumab improves skin barrier function irrespective of *FLG* genotype, suggesting that response to targeted biologic therapy is not contingent on *FLG* status.[15] Overall, integrating MENA-specific genetic context with careful visual assessment and objective severity scoring can improve diagnostic accuracy and optimize treat-to-target management.

Environmental factors likely play a prominent role on disease expression **(Table 2)**. High temperatures, low humidity, air pollution, dust exposure, and urban crowding exacerbate transepidermal water loss and promote cutaneous inflammation.[2,11] Microbiome studies conducted in Egypt demonstrate altered skin microbial diversity in patients with AD, with correlations between dysbiosis and elevated serum IgE levels, supporting environment–immune–microbiome interactions in disease expression.[16]

Country	Prevalence Range	Prevalence	Study	Study Information
United Arab Emirates (UAE)	5.5-39.1%	16.7% 39.1% 11.6% 5.5% 12.9% 14.6% 9% 12%	Silverberg et al. Silverberg et al. Maspero et al. Al Hammadi et al. Ibrahim et al. Ibrahim et al. Al Hammadi et al. Behbehani et al.	Diagnosed AD, large population study. Only ISAAC criteria, large population study. Large population study. Dubai patients covered by private insurance. 1,944 children aged 6-7 years. 1,793 children aged 13-14 years.
Saudi Arabia	12.5-45.4%	19.8% 37.1% 15.3% 45.4% 12.5% 43.5% 32.6% 31.9% 14%	Silverberg et al. Silverberg et al. Maspero et al. Alakeel et al. Al-Frayh et al. Al-Frayh et al. Al-Frayh et al. Al-Frayh et al. Nahhas et al.	Diagnosed AD, large population study. Only ISAAC criteria, large population study. Large population study. 854 Taif citizens. Overall prevalence of physician-diagnosed AD. City of Hofuf. City of Riyadh. City of Jeddah. Children aged 6-12 years.
Egypt	3.6-12.01%	3.6% 12.01%	Maspero et al. Al Dhduh et al.	Large population study. 308 students aged 11-14 years.
Kuwait	19.5%	19.5%	Ziyab et al.	3,775 adolescents aged 11-14 years.
Syria	3.9%	3.9%	Reda et al.[5]	ISAAC
Lebanon	11.5-11.8%	11.5% 11.8%	Hallit et al. Waked et al. Waked et al.	 5,544 children/adolescents aged 5-14 years. 3,909 children/adolescents aged 5-12 years.

Table 1. Epidemiology of atopic dermatitis in the Middle East and North Africa region; *adapted from Mahmoud O, et al. Burden of disease and unmet needs in the diagnosis and management of atopic dermatitis in the Arabic population of the Middle East, 2023*

Abbreviation: ISAAC: International Study of Asthma and Allergies in Childhood

Socio-Cultural Determinants of Disease Expression

Cultural practices have a significant influence on how AD presents and is managed in the MENA region. Clothing customs, including occlusive garments and head coverings, alter local skin microclimates. Studies examining the scalp microbiome of women wearing hijab demonstrate differences in the microbiome compared with uncovered scalps, with potential implications for inflammatory dermatoses.[17]

Traditional remedies and culturally-rooted topical preparations are commonly used, yet they may exacerbate dermatitis or delay patients from seeking medical care.[18] Additionally, stigma surrounding visible skin disease, particularly among women and adolescents, may further discourage timely help-seeking, highlighting the importance of culturally informed counselling.

Healthcare Resources, Geopolitical Context, and Access to Care

Healthcare infrastructure varies widely across the MENA region. While high-income Gulf states may offer access to biologics and other advanced systemic therapies, countries affected by conflict or constrained by limited resources often struggle to provide basic emollients and topical corticosteroids.[2,11] Dermatologist density remains low in many countries, and AD care is frequently delivered by non-specialists.

Global treatment guidelines, largely developed in high-income Western contexts, are often ill-suited to these environments. In response, international health organizations advocate for

Factor	Associated Effect on AD Risk
Urban versus rural dwelling	↑ risk for AD with urban dwelling
Socioeconomic status	↑ risk for allergic sensitization in kids with higher parental socioeconomic status/goods ownership
Education level of parents	↑ risk for allergic sensitization and AD in children with increasing parental education level
Climate	↑ risk for AD in colder climates; ↓ risk for AD with UV light exposure
Pollution	↑ risk for AD with exposure to pollution, maternal exposure to cigarette smoking in prenatal period
Family size	↑ risk for AD with smaller family size
Personal hygiene, sanitation	↑ risk for AD with better personal hygiene in early childhood; ↑ risk for allergic sensitization/AD in children with access to sanitation (modern toilets, piped drinking water)
Antibiotic use	↑ risk for AD with antibiotic exposure in prenatal period and during the first year of life; ↓ risk with antibiotic exposure after the first year of life
Breastfeeding	↓ risk for AD in infants with familial history of AD
Farm and animal exposure	↓ risk for AD with frequent prenatal exposure to farm animals; most protective when compounded with direct exposure; potential ↓ risk with postnatal exposure to furry pets, particularly dogs
Intestinal microflora	↓ risk for AD with greater diversity of gut microflora in infancy; ↓ risk for allergic sensitization/AD with colonization favoring lactobacilli and bifidobacteria in infancy or childhood

Table 2. Environmental risk factors for atopic dermatitis; *adapted from Al-Afif KAM, et al.. Understanding the burden of atopic dermatitis in Africa and the Middle East., 2019*

integrating common inflammatory skin diseases such as AD into primary care frameworks, including teledermatology and resource-stratified treatment algorithms.

Disease Burden and Quality-of-Life

AD imposes a substantial humanistic and economic burden on populations across the MENA region. Multi-country analyses demonstrate that adults and adolescents with AD lose an average of approximately 0.19 quality-adjusted life years annually, with indirect costs accounting for nearly two-thirds of total disease-related expenditures.[19] In several countries, AD-related costs represent up to 0.04–0.08% of national gross domestic product.[19]

Sleep disturbance, reduced school and work productivity, heightened anxiety and depression, and caregiver burden are consistently reported, often rivalling or exceeding those associated with other chronic inflammatory diseases.[12,19]

Patient Education Awareness and Misinformation

Surveys from Egypt and Lebanon identify substantial gaps in patient education, structured support programs, and access to digital health resources.[20] While social media platforms provide opportunities for engagement and peer support, they also facilitate the dissemination of misinformation, including the promotion of ineffective or harmful treatments. Addressing these gaps is critical for improving long-term outcomes.

Implications for Management and Future Directions

Optimizing AD management in MENA populations requires a multilevel approach that incorporates phenotype-specific assessment, cultural competence, and resource awareness. Priorities include earlier diagnosis in primary care, individualized education addressing chronicity and pigmentary sequelae, and improved inclusion of MENA populations in clinical trials. Expanded research into genetic, microbiome, and environmental modifiers of disease is essential.

Conclusion

AD in MENA populations exemplifies the intersection of immune dysregulation, environmental influences, cultural practices, and structural inequities. Dermatologists must look beyond simplistic ethnic classifications to recognize the diverse, context-dependent realities of these patients. Advancing equitable dermatologic care will require better representation of MENA populations in research, adapting guidelines to resource-constrained settings, and addressing socio-cultural barriers to dermatologic care.

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