

# INCREASED SKIN PH AND TRANSEPIDERMAL WATER LOSS MAY SERVE AS PREDICTOR FOR ATOPIC DERMATITIS FLARES

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## INTRODUCTION

Atopic dermatitis (AD) is a common, chronic relapsing skin disease, characterized by periods of flares, followed by periods of remission while having a permanent background of skin dryness. Alterations in epidermal barrier function have been shown to play a key role in pathogenesis of AD. Transepidermal water loss (TEWL) and skin pH are important indicators for skin health with an important role of skin pH as a regulator of the epidermal barrier homeostasis and of the skin microbiome diversity. Skin pH plays also a role in desquamation, permeability, and stratum corneum cohesion. To demonstrate the relationship between epidermal barrier alteration and clinical manifestation of AD, a longitudinal study monitoring both epidermal barrier function and AD severity has been performed.

## MATERIAL & METHODS

25 subjects were enrolled in this study: 15 subjects (10 female, 5 male) with atopic dermatitis (AD) and 10 healthy volunteers serving as a control (9 female, 1 male), with a mean age of 35.2 years old

Skin barrier function was assessed with measurement of skin pH, TEWL and skin hydration in healthy skin of healthy controls and peri-lesional and lesional skin of AD subjects.

To determine the relationship between skin pH and AD flares the evolution of skin barrier function over the period of 6 weeks were compared to the changes in disease severity evolution.

Disease severity was evaluated using a modified local Scoring Atopic Dermatitis (SCORAD). To evaluate the AD predictive potential of changes in skin pH and TEWL, we used a Support Vector Machine (SVM) machine learning classifier, to classify flares vs non-flares periods with Visit-1 and Visit -2 pH and TEWL lesional vs peri-lesional differences. Measurements were made using a pH Meter PH905 and Tewameter® TM 300.

In this study, the changes in skin pH, TEWL over time in healthy, peri-lesional and lesional skin were compared to the changes in disease evolution.

## RESULTS

Skin pH and TEWL were significantly higher in lesional skin compared to non-lesional skin of AD patients and healthy volunteers (Figure 1a and 1b).

There was a positive association between skin pH and TEWL values with AD progression based on clinical severity assessment. The mean difference between lesional and peri-lesional skin pH and TEWL was significantly higher during a flare (Figure 2). The machine learning model produced an average balanced accuracy, measured on the 5-fold cross-validation test sets, of 74% with an average sensitivity of 81% and 67% specificity, suggesting a good predictive value and confirmed that even if these indicators did not fully explain the AD severity alterations, they explained a significant proportion of the AD variability.

Figure 1a: Skin pH at baseline

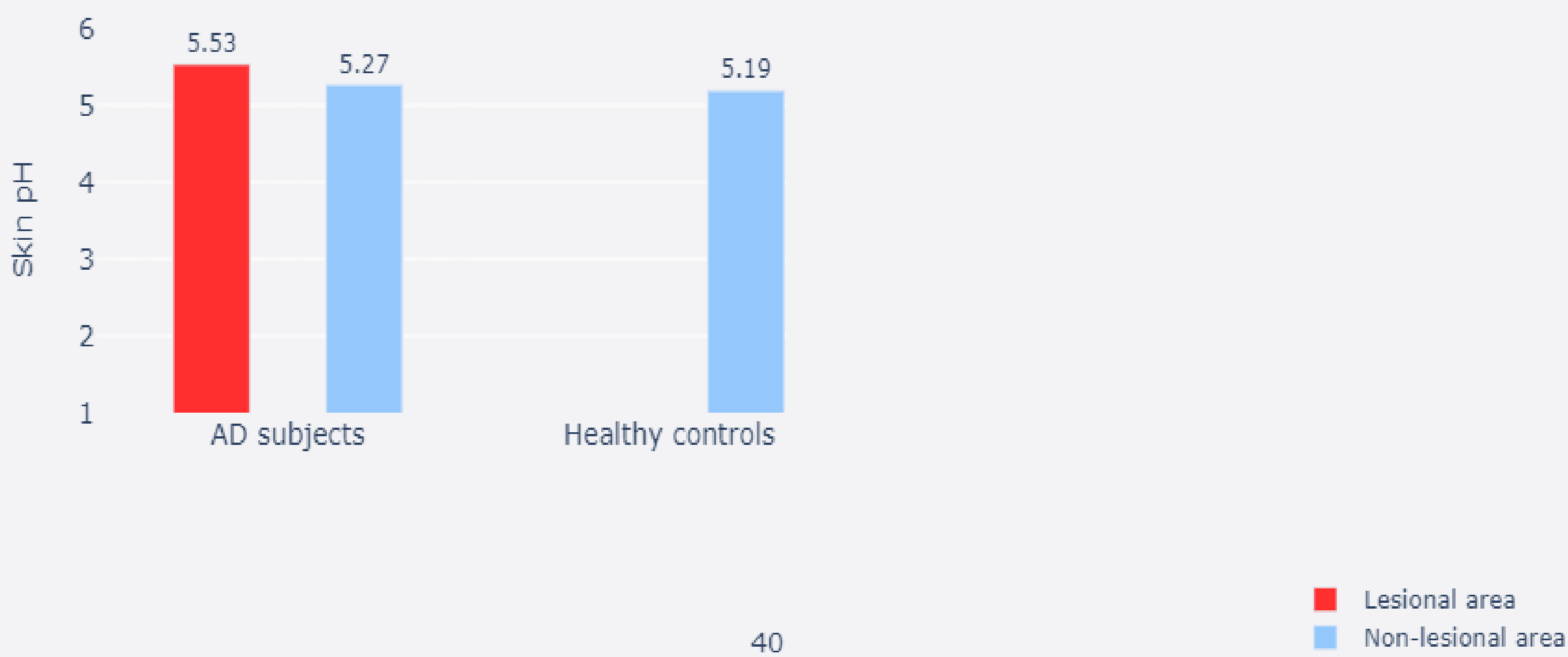


Figure 1b: TEWL at baseline

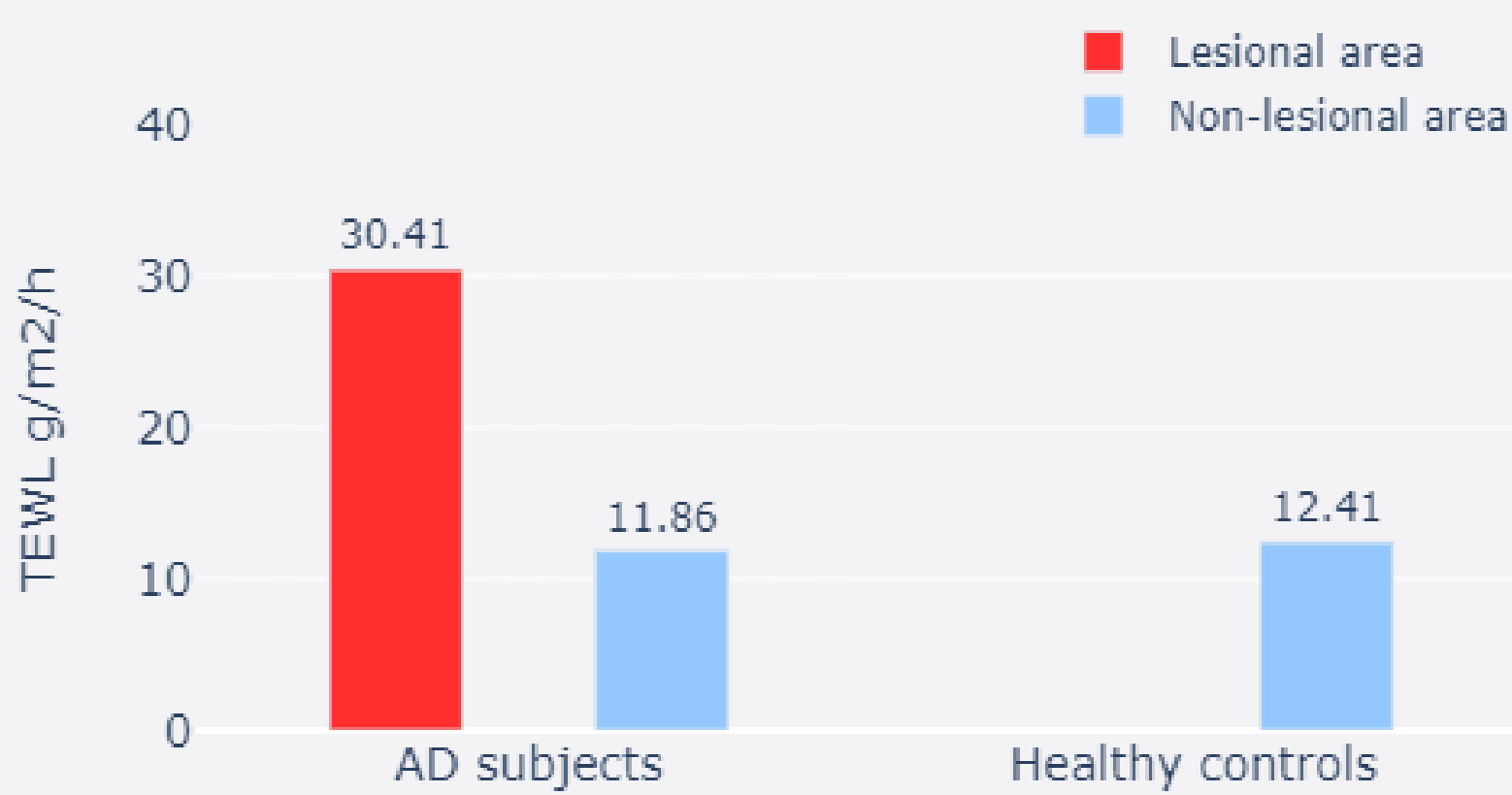
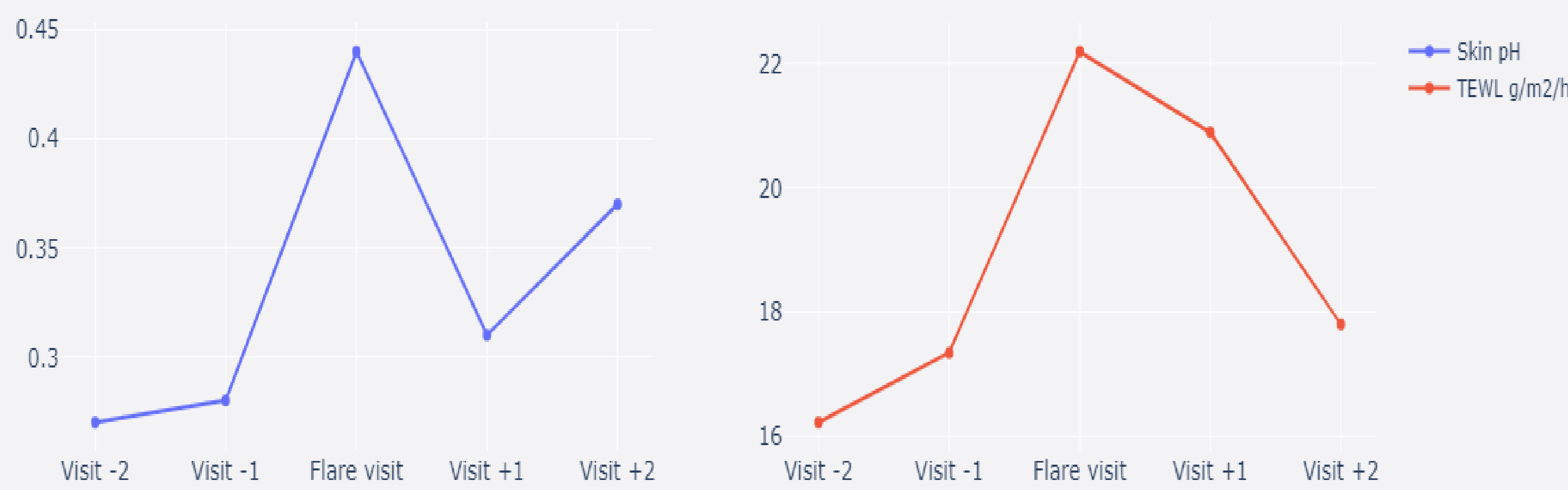


Figure 2: lesional vs peri-lesional mean difference evolution of skin pH and TEWL over time



## DISCUSSION

This study confirms that the epidermal barrier function in patients with AD is defective and that the level of dysfunction, quantified by pH and TEWL, correlates with AD disease severity. According to these results, it appears that skin pH and TEWL may be used as markers to predict skin flares and worsening of atopic dermatitis. Normalization of skin pH and TEWL could have therapeutic potential in prevention of AD flares.

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