Atopic dermatitis in adolescents with acne vulgaris

Atopic dermatitis (AD) is a chronic skin disease characterized by severe pruritus, erythema, edema, crusting, excoriation, lichenification and skin dryness. AD is often diagnosed during childhood, though the onset of symptoms may occur at any time. Lesions in older children and adults are usually located in flexural areas along with the head and neck. Facial involvement is also common in AD, not only in children but additionally in adolescents [1]. This inflammatory disease is characterized by skin microbial dysbiosis and barrier dysfunction. Initial inflammation has a T2 profile in response to allergens, which is later amplified by skin barrier breaking and reduction of antimicrobial peptides. This promotes skin pathogens growth (mainly *Staphylococcus aureus*) and the evolution to a T2, T1 and T17 pattern [2, 3]. AD is often associated with other atopic diseases such as rhinitis and asthma.

Acne vulgaris (AV) is highly prevalent in adolescent and according to some authors, affects nearly all people between the ages of 15 and 17 years [4]. This multifactorial disease is associated with changes in the microbiome, hormonal status and sebaceous production that leads to a cutaneous inflammatory process mediated by T1 and T 17 cells. This process also involves the activation of TOLL like receptors by the antigens of *Cutibacterium acnes* [5]. Acne lesions are classified as non-inflammatory (comedones) or inflammatory (papules, pustules and nodules) and cicatricial acne. As for severity, acne is classified from minimal to very severe, according to the extension and type of lesions. Disruption of the skin barrier in acne facilitates the entry of additional allergens or other antigens [2, 5].

Atopic dermatitis is treated with topical steroids and topical immunosuppressants. In more severe cases of AD, systemic corticoids, biologic drugs (anti interleukins or their receptors) and JAK inhibitors should be considered [6]. Acne treatment relies on antibiotics, retinoids and sebum production modifiers. In females, hormonal therapy may also be added [7]. Self-care measures can improve disease control and prevent new outbreaks in both conditions.

Both acne vulgaris and atopic dermatitis have a great impact on quality of life [8].

A recent study concluded that individuals with AD have the same prevalence of AV as non-AD individuals [9]. Considering the different pathogenesis of these clinical conditions and given the high morbidity associated with atopic dermatitis and acne in pediatric populations, our aim was to investigate if adolescents with AV have different expressions of AD and the impact in quality of life of both diseases.

For this purpose, we selected a representative sample of people aged 14–17 years. A questionnaire was distributed randomly to students from four different schools in Lisbon, Portugal, between February and June of 2021. Acne vulgaris was diagnosed in 71.3% (95%CI 65.6-77.3) of the adolescents. A cross-sectional, prospective study involving the high school students with acne vulgaris (n=170) was then performed. The questionnaire collected demographic data, clinical information about acne, atopic dermatitis, asthma and rhinitis and treatments used. The cohort also responded to Dermatology Life Quality Index (DLQI) and to Global Health Evaluation Scale (GHES).

Statistical analysis was done using non-parametric tests for group comparison, as data did not meet the normality assumption. For categorical variables, we used Fisher's test and for continuous variables, Wilcoxon rank sum/Mann-Whitney test was used. There was statistical significance for p-values <0.05.

This study obtained ethical approval from the Ethics Committee of Hospital Santa Maria on 20th of September 2020. All participants and respective parents provided informed consents.

The results are summarized in Table 1 and Table 2.

[Insert Table 1.]

[Insert Table 2.]

We found a frequency of 12.4% of atopic dermatitis in adolescents with acne. In a recent international study, that involved adolescents aged 12 to 18 years from 18 countries, the following values of AD prevalence were found in European Countries: Germany 8.7%; France 14.4%; UK 15%; Italy 18% and Spain 19.8% [10]. Few studies address skin diseases prevalence in this age group. The frequency of AD in the acne cohort is in agreement with population-based studies of atopic dermatitis prevalence, although closer to the lower values reported in more recent studies.

Although the pathophysiological mechanism of atopic dermatitis could justify lower expression of the disease in patients with acne, the chronic inflammation and disruption of the barrier function could induce, in contrast, the development of AD. Acne or AD often triggers the onset of "skin-picking" which worsens both conditions [11]. Accordingly, this study showed that AD was present in adolescents with worse acne evolution, more scars and a more severe type of acne, despite similar demographic characteristics of both sub-groups [2, 3, 5].

Diagnosis by physician was reported by more than half of the patients with atopic dermatitis and only 39% of the patients with isolated acne. The use of treatments and adjuvants was similar in both groups. In fact, 80% of the adolescents confirmed the use of cleaning gel, moisturizing creams, solar protector, exfoliator, make up or make-up remover irrespective of the presence of AD. This seems to be a positive finding, as emollients and other non- medical products may decrease the number of flares and the use of medication. Availability of these products increases long-term adherence [12]. Medical treatment ranged from 62 to 67%, which is a relatively low percentage. The disease chronicity, frequent relapses and reduced medical diagnosis could be a plausive explanation to the reduced therapeutic accomplishment [13].

Adolescents with AD used corticosteroids more often and the difference observed between groups was statistically significant, as expected [6]. Interestingly, no differences were observed concerning asthma/rhinitis diagnosis or the use of antihistamines.

Finally, adolescents with both conditions had lower scores of Dermatology Life Quality Index (DLQI) and felt more embarrassed because of their skin appearance. This difference was statistically significant. The presence of lesions in visible areas of skin may cause emotional troubles in patients, including low self-worth, embarrassment,

sorrow and social isolation. Mental disorders and affected quality of life is reported in patients with acne vulgaris, atopic dermatitis, psoriasis, ichthyosis, vitiligo, and hidradenitis suppurativa [8]. Although adolescent acne is mainly considered minimal or mild and atopic dermatitis is classified as mild by most of the adolescent patients [8, 14], the chronic treatment requirements and relapsing courses may increase the self-perception of symptom severity and affect negatively the quality of life [8]. Adolescence is a period of time with several biological, social and emotional changes and the burden of two diseases that have a great impact on the quality of life should be taken into consideration. To our knowledge, this is the first study that determines AD frequency among adolescents with acne and the impact of these diseases on their quality of life. These findings should be considered in the management of adolescents with these skin diseases.

Declarations:

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