Lower facial skin hydration level increases acne vulgaris severity level

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ABSTRACT

Backgrounds: Acne vulgaris is a chronic sebaceous gland inflammatory disorder that predominantly affects adolescents and young adults. Increased sebum, alterations in follicular keratinization, Cutibacterium acnes colonization, and inflammation are the critical pathways in the pathogenesis of acne vulgaris. Facial skin hydration can affect the primary pathogenesis mechanism of acne vulgaris. This study aimed to examine the correlation between the level of facial skin hydration and the severity of acne vulgaris.

Methods: This study was an observational analytical study of 40 subjects with acne vulgaris and 40 subjects without acne vulgaris, using a cross-sectional design. The subjects’ facial skin hydration was analyzed using a CM 825 corneometer, and the severity of acne vulgaris was assessed based on Lehmann’s criteria. Data were analyzed using the Spearman correlation test. Health Research Ethics Committee of the Faculty of Medicine at the University of North Sumatra has approved this study.

Results: Of the 40 subjects with acne vulgaris, women dominated (65 %) with a mean age of 19.6 ± 1.86 years old. Most subjects had moderate (50 %) degrees of acne vulgaris, followed by mild (42.5 %) and severe (7.5 %) degrees. In acne vulgaris subjects, the considered normal level of facial skin hydration was 92.5 %. The facial skin hydration found in acne vulgaris subjects had moderate (50 %) degrees of acne vulgaris, followed by mild (42.5 %) and severe (7.5 %) degrees. In acne vulgaris subjects, the considered normal level of facial skin hydration was 92.5 %. The facial skin hydration found in acne vulgaris subjects was lower than non-acne vulgaris subjects with a p-value of 0.002. The degree of facial skin hydration is associated with the severity of acne vulgaris with moderate strength correlation values (p= <0.001, r= -0.453).

Conclusions: A significant correlation exists between the level of hydration of the facial skin and the severity of acne vulgaris. The lower facial skin hydration level could promote the more severe form of acne vulgaris.

Keywords: acne vulgaris, skin hydration, severity.

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INTRODUCTION

Acne vulgaris (AV) is a chronic inflammatory disease of the skin's sebaceous glands with polymorphic manifestations of blackheads, papules, pustules, nodules, or cysts.1 Studies found that about 90% of men and 80% of women had experienced AV, particularly in adolescents and young adults.2 There are four fundamentals of AV pathogenesis: increased sebum production, follicular keratinization changes, Cutibacterium acnes (C. acnes) bacteria colonization, and inflammation. The mechanisms of AV are still being investigated up to this point.3

The balance of skin hydration and sebum is also thought to influence comedogenesis. Skin with less than 10% moisture content could result in impaired stratum corneum and inflammatory cytokine production. Therefore, adequate water content (10-20 %) is essential in acne vulgaris prevention.4,5 A study by Yamamoto et al. found that AV was more common in the skin with higher trans-epidermal water loss (TEWL) and sebum secretion, and lower stratum corneum hydration. The increase in TEWL was observed to show a more severe form of AV. Therefore, it is estimated that TEWL-affected skin hydration is also a determinant of AV occurrence and could affect the degree of AV severity.6 Moisturizer application has been shown to have good efficacy in AV management.1 This study aimed to determine the correlation between the level of facial skin hydration and the degree of AV severity so that skin hydration’s role in AV pathogenesis could be evaluated.

METHOD

This study had obtained ethical clearance from the Research Ethics Committee of the Faculty of Medicine, Universitas Sumatera Utara/H. Adam Malik Hospital with letter number 225/TGL/KEPK FK USU-RSUP HAM/2020 dated March 12, 2020. This study was a cross-sectional study with a consecutive sampling method involving AV and non-AV subjects, consisting of 40 people in each group according to the severity of acne vulgaris, using a cross-sectional design. The inclusion criteria for AV groups were: aged 18-25 years, willing to participate in the study, and signed a consent letter. AV subjects who were pregnant, breastfeeding, or who had received previous systemic or topical treatments in the last month were excluded from the study. We also excluded: 1)
patients who used face moisturizers for more than two weeks; 2) an active smoker for about five years with an average of one pack of cigarettes daily; 3) used hormonal contraception; 4) have dermatoses such as atopic dermatitis, ichthyosis, psoriasis, and xerosis. Subjects without acne vulgaris also had the same inclusion and exclusion criteria as the AV subjects.

The patient demographic data collected were age, gender, telephone number, and address. Determination of the AV degree was based on the acne Grading Indonesian acne Expert Meeting 2015 by Lehmann. After then, skin hydration tests using a CM 825 cornometer were performed three times each on the left cheek, right cheek, forehead, and chin. The mean value of skin hydration from each location and all examinations were calculated. Using the Spearman correlation test, the collected data were statistically analyzed to evaluate the correlation between the level of facial skin hydration and the degree of AV.

**RESULTS**

Characteristics of the subjects included in this study were gender and age from each group. In 40 AV subjects, it was found that there were more females (65%) than males (35%), as described in Table 1 with a mean age of 19.60 ± 1.86 years old.

Subject distribution based on the degree of severity of AV is described in Table 2. Most subjects in this study (50%, 20 of 40) had a moderate AV degree, followed by mild degree and severe degree (42.5%, 17 subjects, and 7.5%, three subjects, respectively). AV subjects had a relatively good level of facial skin hydration in 37 subjects (92.5%) with mean hydration of 62.90 ± 7.87 AU, described in Table 3.

The mean facial skin hydration level in the AV group was lower (61.20 ± 9.69 AU) than the non-AV group (66.73 ± 5.25 AU). Based on the T Independent test, it was observed that there was a significant difference in the mean value of facial skin hydration level between AV and non-AV subjects (p = 0.002), which is described in Table 4.

The correlation between the level of facial skin hydration with the severity of acne vulgaris can be seen in Table 5. A Spearman correlation test analysis found a significant association between skin hydration level and severity of AV with a negative and moderate strength correlation (p = <0.001, r=-0.453). This analysis means that a lower level of facial skin hydration would cause a more severe AV degree.

**DISCUSSION**

Of the 40 research subjects, most AV patients were female, with the mean age being 19.60 ± 1.86. The prevalence of AV in women was higher compared to men in studies conducted by Zohra et al. (62.5%), Jusuf et al. (65%), Puspita et al. (80%), and Rahmayani et al. (60.6%).

Hormonal fluctuations throughout the menstrual cycle probably play a major role in the onset of AV in women by up to 85%. Besides, women are also affected by comedogenic cosmetics, stress factors that trigger an increase in cortisol and androgens, and their physical appearance concern.
Research in India found that the mean age of AV patients was 19.78 ± 4.94 years. In Medan, AV incidence was the highest among people between the ages of 18-25. AV prevalence increases with age. The prevalence of AV is 76.7%, 88.2%, and 97.1% in the age group of 10-13 years, 14-16 years, and 17-19, respectively. It will gradually decline to 8% in people aged 25-34 years and 3% in 35-44 years. High levels of androgens during puberty cause increased secretion of sebum, resulting in abnormal desquamation and follicular obstruction of the skin.

Most subjects in this study (50%, 20 of 40) had a moderate AV degree, followed by mild degree and severe degree (42.5%, 17 subjects, and 7.5%, three subjects, respectively). The higher prevalence of AV with moderate severity was also found in studies by Zofra et al. (41.67%), Hidayati et al. (81.4%), Sutristo et al. (45%), and Yutrishia et al. (59.3%). In contrast to the study, Yahya et al., Shen et al., and El-Hamd et al. found that the prevalence of AV with mild severity was higher than other types of severity (93.1%, 68.4%, 53%, respectively).

According to the severity, the different proportions of AV can differ due to differences in subjects' age. It might be related to the peak serum DHEAS hormone concentration at the age of 20-30. Testosterone, as the DHEAS metabolite, will be converted into DHT and will stimulate sebum production. This excessive production of sebum is closely associated with AV severity. Also, with a more common form of inflammatory lesion than the blackhead types, Asians tend to develop the more severe conditions of AV lesions.

The majority of AV subjects in this study (92.5%, 37 of 40) had a relatively good facial skin hydration level with mean hydration of 62.90 ± 7.87 AU. These findings were in line with other studies conducted by Kmiec et al., Inui et al., and Kantikosum et al., that also found good facial skin hydration in their AV subjects with a mean value of 56.9 ± 6.84 AU, 51.7 ± 7.9 AU, and 45.17 ± 9.31 AU, respectively.

Assessment of skin hydration using a corneometer can detect hydration ranging from <30 AU (very dry), 30-45 AU (dry), and > 45 AU (good). A well-functioned water loss barrier of the stratum corneum will reflect well-hydrated skin. The most common skin condition, acne vulgaris, is usually associated with loss of barrier structure and function. Inflammatory AV lesions are said to be associated with the impaired stratum corneum barrier.

The mean facial skin hydration in the subject group with AV was lower than that of the non-AV subject group (61.20 ± 9.69 AU vs. 66.73 ± 5.25 AU). In contrast to these findings, Zhou et al. found that facial skin hydration in AV patients was higher than non-AV subjects (55.07 ± 7.4 AU vs. 52.3 ± 6.18 AU). However, the results were not significant (p > 0.05), and they did not exclude subjects who had used facial moisturizers before the assessment.

All non-AV subjects (100%) and all subjects with mild AV (100%) had good skin hydration. In moderate AV, 94.7% of subjects had good skin hydration levels, while only 33.3% of severe AV subjects had good skin hydration. Well-hydrated skin will help boost the development of commensal bacteria in the skin. The decrease in sphingolipids and ceramides in AV patients resulted in the deficiency of intracellular membrane lipids and impaired stratum corneum barrier permeability. Moreover, TEWL increase could also cause decreased hydration in AV patients.

Also, the decrease in phytosphingosine, which plays an essential role in the skin's permeability and antimicrobial defense, could cause alteration in the skin barrier, promote inflammation and infection, and impair the water barrier function of the skin. Decreased level of skin hydration, cracked skin, and desquamation will clinically cause changes in the skin barrier's function, facilitating the invasion of pathogens in the pilosebaceous unit that has been shown to cause inflammatory reactions.

This study showed a significant correlation between the level of skin hydration and the degree of AV severity. In other words, a lower level of facial skin hydration could promote a more severe form of AV. This relationship has a negative correlation value and a moderate strength (p <0.001, r = -0.453). These results were in line with previous studies by Yamamoto et al. that found a significant decrease in facial skin hydration among 65 AV patients.

Isoda et al. also found that lesions in mild AV patients were significantly reduced after treated with facial washes and moisturizers containing pseudo ceramides and eucalyptus extracts that promote skin hydration improvement and increased levels of endogenous ceramides in the corneum layer significantly.

CONCLUSIONS
This present study found a significant correlation between the level of skin hydration and the degree of AV severity. The lower facial skin hydration level could promote the more severe form of AV lesions.

DISCLOSURE
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CONFLICT OF INTEREST
The authors declare that they have no conflict of interest related to this article publication.

REFERENCES
2. Alanazi MS, Hammad SM, Mohamed AE. Prevalence and psychological impact of Acne vulgaris among female secondary


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