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Recent review on the role of brain derived neurotrophic factor on acne vulgaris

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Abstract

Introduction: The pilosebaceous unit is impacted by the chronic multifactorial illness known as acne, which causes both inflammatory and non-inflammatory lesions. Although acne is a self-contained benign lesion, patients frequently experience anxiety, despair, low self-esteem, and social isolation. There is significant debate over how stress affects acne vulgaris.

Aim of the study: To evaluate the serum level of brain-derived neurotrophic factor (BDNF) in acne vulgaris patients in relation to acne vulgaris severity.

Subjects and methods: This meta-analysis follows the PRISMA flow diagram. This study aims to investigate the role of BDNF in the pathogenesis of acne vulgaris by assessing its levels in the serum of patients with acne vulgaris compared with normal individuals.

Results: After the search and screening, one study was eligible for inclusion in our meta-analysis. Results of the meta-analysis show that BDNF in serum is significantly lower in the patient group compared with the control group ($P < 0.001$). The pooled effect estimate revealed that there is a significant difference between BDNF levels in serum according to grade: mild, moderate, and severe subgroups ($P < 0.001$).

Conclusion: Our study may provide evidence that serum BDNF plays a role in acne pathogenesis. BDNF is significantly lower in acne patients; it also plays a role in different dermatological diseases related to stress, such as vitiligo and psoriasis.

Key words: Acne vulgaris and Stress; BDNF; vitiligo and psoriasis.

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1. Introduction

Acne vulgaris is a disorder that only affects oneself. Patients typically experience

unease, doom, reduced certainty, and social isolation [1].

The impact of stress on acne vulgaris remains unclear. Human sebocytes have been found to exhibit some neuroendocrine receptors, including those for beta-endorphin, melanocortins, vasoactive intestinal peptide, and calcitonin gene-related peptide [2].

Inflammatory cytokines and androgen metabolism are mediated by ligand-receptor binding mechanisms, which control the development and clinical course of acne vulgaris and its pathogenesis [3].

A member of the neuroendocrine growth factor family, brain-derived

neurotrophic factor is found in both the central and peripheral nerve systems [4].

Neuroendocrine elements originating from the brain are thought to play a role in affective behaviors such as stress and depression [5].

It was discovered that BDNF may play a role in the pathophysiology of some dermatological conditions that are exacerbated by stress, such as vitiligo and psoriasis [6].

There hasn't been any research on the connection between BDNF and acne vulgaris.

2. Subjects and methods

2.1. Study design

The Cochrane Handbook's recommendations and the PRISMA flowchart are both followed in this meta-analysis eligibility requirement.

Inclusion criteria

- People who have acne vulgaris
- Age: greater than 18 but less than 35.
- Sexuality: both sexes

Exclusion criteria

- Patients who received any systemic and/or topical acne treatment in the last 3 months.
- pregnant and lactating females.
- Patients with other dermatological diseases.
- Patients with any systemic illness, autoimmune diseases or infections.

2.2. Information Sources

We looked for linked entries in the databases of PubMed, Scopus, Web of

Science, and Cochrane Central up until April 2021. The four articles listed below are part of the strategy: Reduced brain-derived neurotrophic factor serum levels in patients with first-onset vitiligo, decreased brain-derived neurotrophic factor plasma levels in psoriasis patients, and associations between brain-derived neurotrophic factor and depressive symptoms in young adults with acne vulgaris are some of the studies that have been conducted.

2.3. Search and Study Selection

People with acne and stress issues were included in interventional and observational research. The included articles were reviewed in three stages. The first step involved utilizing EndNote Software [7] to import the findings from electronic databases onto a Microsoft Excel [8] sheet. The second step involved two independent authors assessing the article titles and abstracts that were entered into the Excel sheet. The included citations from step 2

were subjected to full-text screening in the third stage. Additionally, we manually checked the included articles' references for any potential overlooked studies.

2.4. Data Collection

We gathered information on: A) the participants' initial demographics. B) Results endpoints that included serum BDNF levels C) Information for assessing the risk of bias was included in the third category. Microsoft Excel was used for the data collection process [9].

2.5. Risk of bias Assessment

Using Cochrane's risk of bias methodology for clinical trials [10], two writers evaluated the likelihood of bias among the included papers. Through seven domains [10], the instrument evaluates patient randomization, allocation concealment, and sufficient blinding. Each domain is assigned a risk of bias rating of "low," "unclear," or "high." Main outcomes and measures

Prior to data collection, all outcomes were determined, including decreased levels of BDNF in patients with acne vulgaris, decreased serum levels of BDNF in relation to the severity of acne, and decreased serum levels of BDNF in patients with various stress-related dermatological diseases, such as vitiligo and psoriasis.

2.6. Statistical Analysis

Using Review Manager software, we conducted the meta-analysis of this study, which comprised both continuous and dichotomous outcomes. We used mean difference (MD) and 95% confidence interval (CI) for the analysis of continuous data and risk ratio (RR) and 95% CI for the analysis of dichotomous data. All of the data were shown as the mean standard deviation from various independent experiments [11]. Students' t-tests were used to analyze the differences between two groups, and an analysis of variance (ANOVA) was employed to compare the differences between at least three groups. Statistical significance is defined as a P-value of 0.05.

3. Results

A systematic review of four articles found that BDNF is implicated in acne vulgaris. This meta-analysis showed that BDNF significantly decreased in acne vulgaris cases compared to the control group; it also decreased in relation to acne severity. Not only that, BDNF is decreased in dermatological diseases related to stress such as vitiligo, psoriasis, psoriasis and acne vulgaris. Age and sex of the study groups are

shown in **Table 1**. This study showed that there was a highly statistically significant difference between patient and control regarding BDNF level in serum ($P < 0.001$) (**Table 1, Figure 1**).

The pooled effect estimate revealed that there is significant difference between BDNF levels in serum according to grade mild, moderate, and severe subgroups ($P < 0.001$) (Figure 2).

Table 1: Clinical and demographic characteristics of patients and control.

Variables	Acne patients N=70	Control N=20	P-value
Age (years)	21.33±0.47	25.10±1.69	0.2
Gender	Male	6 (30%)	0.51
	Female	14 (70%)	
BDNF	8016.55 (344.19- 6000)	382.63 (236.55- 570.1)	0.001*

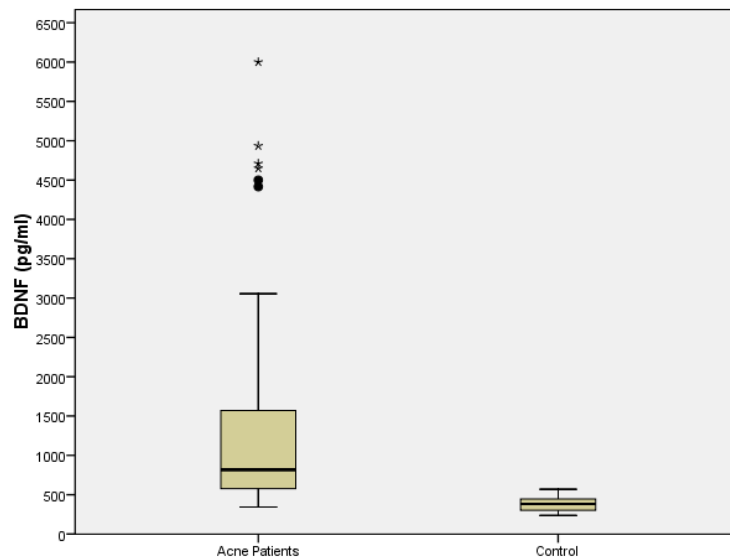


Figure 1: BDNF levels in serum.

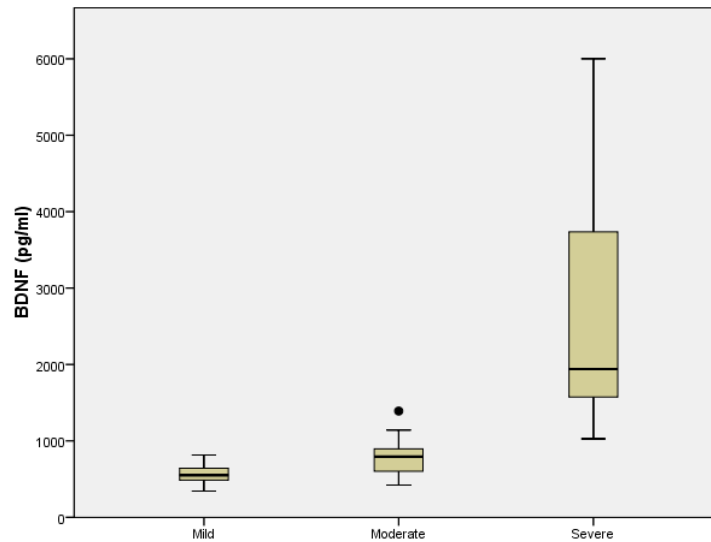


Figure 2: BDNF in serum by Grade.

4. Discussion

Blackheads, whiteheads, open comedones, closed comedones, nodules, and cysts are some of the acne lesions that can appear on the skin. Acne is a chronic inflammatory disease of the pilosebaceous unit. Pathological and immunochemical analyses can be used to detect inflammation [12].

Brain acne vulgaris and depression are strongly associated, and neurotrophic factor is one of the growth factors that supports neuronal survival and maintenance and plays a significant role in depression [13].

In clinical practice, adolescents have an estimated 86% prevalence of acne vulgaris. The diagnosis of acne vulgaris varies depending on the patient's educational background, social standing, and personal perceptions [14].

Since antidepressant-free patients had low serum levels of BDNF, it is a

reliable biomarker for changes in quality of life [15].

Many studies that examined the relationship between BDNF levels and psychological conditions such as depression, anxiety, addiction disorders, eating disorders, and schizophrenia found a strong correlation between the emergence of these last few psychiatric disorders and declining BDNF levels [16]. The degree of psychological influence on quality of life and acne severity are closely correlated [17]. Due to their negative self-perception and the psychosocial opinions of others, patients with acne vulgaris have low levels of confidence and self-esteem [18].

In teenagers with acne vulgaris, depressive symptoms were inversely correlated with BDNF levels. The function of BDNF in the etiology of acne vulgaris seems promising for scarring acne treatment [18].

In a total of four articles, in searching for the role of BDNF in acne vulgaris and different dermatological diseases related to stress, all studies found a significant association with acne vulgaris, first-onset vitiligo, and psoriasis.

The meta-analysis of this study revealed that there was a significant

Conclusion

This systematic review and meta-analysis suggest that BDNF has potential risk variations for acne vulgaris and dermatological diseases related to stress.

Understanding the susceptibility factors and biological pathways involved in

Ethical approval: The Ethics Committee of Research at Fayoum University's School of Medicine approved the current study.

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decrease in serum levels of BDNF in acne vulgaris patients as compared to controls. Also, there was a significant decrease in BDNF in relation to acne vulgaris severity in patients with first-onset vitiligo and in psoriatic patients as compared to control.

the pathogenesis of acne will help us gain insights into developing effective treatments. This study has many limitations, including that it is a case-control study, so it may be liable to be associated with a retrospective nature and don't demonstrate the causation.

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