



The Relationship between Brain-derived Neurotrophic Factor's Serum Level and Hospital Anxiety and Depression Scale-depression in Patients with Psoriasis Vulgaris

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Abstract

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BACKGROUND: Psoriasis vulgaris is a chronic inflammatory skin disorder that can lead to depression. The involvement of the nervous system in psoriasis was proved by the influence of brain-derived neurotrophic factor (BDNF) in regulating keratinocyte homeostasis. Low level of BDNF in patients with psoriasis result in transit amplifying subpopulation of basal keratinocytes not performing their function as inhibitors of keratinocyte proliferation, resulting in acceleration of keratinocyte proliferation. In depressed patients, it is known that levels of BDNF in the serum and hippocampus are low. BDNF level imbalance potentially affects the severity of psoriasis and depression.

METHODS: This is an analytical cross-sectional study. The measurement of BDNFs serum level was carried out in the Medan Private Laboratory using a human BDNF (R and D®, USA) kit using the ELISA method. We use hospital anxiety and depression scale (HADS-D) questionnaire to assess depression symptoms.

RESULTS: The results of the Spearman correlation test for BDNFs serum level and HADS-D showed $p < 0.05$, it can be concluded that there is a correlation between BDNFs serum level and HADS-D. The strength of the relationship between HADS-D and BDNFs serum level is -0.537 that shows moderate correlation ($r = 0.4 - <0.6$). Relationship between HADS-D and BDNFs serum level is -0.537 that shows moderate correlation ($r = 0.4 - <0.6$).

CONCLUSION: This study shows a moderate negative relationship between BDNFs serum level and the degree of symptoms of depression, which the lower level of BDNFs serum will increase the degree of depression symptoms.

Introduction

Psoriasis is a chronic inflammatory skin disease, with the presumption that genetic factors significantly affect the appearance of this disease [1]. The involvement of the nervous system in psoriasis was proved by the influence of brain-derived neurotrophic factor (BDNF) in regulating keratinocyte homeostasis [2]. In addition to its role in keratinocytes, BDNF has also has role in depression. In depressed patients, it is known that level of BDNF in the serum and hippocampus is low [3], [4].

The prognosis of psoriasis vulgaris is unpredictable. Research that followed psoriasis patients for 21 years found that, as many as 71% of patients experienced persistent lesions, 13% of patients recovered completely and 16% of patients experienced intermittent symptoms [5].

Psychological and social pressures that can be experienced by psoriasis patients are stigma and shame which results in depression. Studies report that the prevalence of depression in psoriasis patients is

10–62% [6]. A cross-sectional study found that 32% of people living with psoriasis were depressed from a total of 265 psoriasis patients [7].

Patients with psoriasis have a higher tendency to be depressed than leprosy, vitiligo, and lichen planus. Depression in patients with psoriasis affects treatment compliance so that if treatment is not overcome; treatment is impossible to achieve [6].

The chronic course of psoriasis and the drug that has not been found has the potential to cause depression. The meta-analysis study conducted by Dowlatshahi *et al.* found that people with psoriasis had a tendency to depression as much as 1½ times that of healthy individuals [8].

Study by Fortune said that psychological disorders that could occur in psoriasis patients were appearance problems being esthetic cause sufferers to become inferior, social rejection, feelings of guilt, shame, feeling empty, and sexual disturbances to disruption to work [9]. Psychological disorders in psoriasis can even lead to suicidal ideas.

Cooper-Patrick *et al.* said, the prevalence of suicide ideation in people with psoriasis is higher

than other medical conditions or in the population as a whole [10].

Based on the explanation above, there is a link between psoriasis, BDNF, and depression, so we want to know for sure about the relationship between BDNF's serum level and depression's symptoms in patients with psoriasis vulgaris.

Methods

Patient sample

This study is an analytical cross-sectional, from May to July 2018, at outpatient clinic of Immunodermatology Division of Department Dermato-Venereology, H. Adam Malik Hospital, Medan, Sumatera Utara, Indonesia. The subjects who participated were 46 people. Inclusion criteria in the study as follows: Patients who were diagnosed clinically as sufferers of psoriasis vulgaris, aged 20–65 years, willing to participate in research and sign informed consent. The exclusion criteria in this study were as follows: Patients with psoriasis vulgaris who were pregnant and breastfeeding, patients with psoriasis vulgaris who were using topical drugs to treat psoriasis vulgaris (topical corticosteroids, calcipotriol, tazarotene, and tar) at least 2 weeks before research and systemic (methotrexate, acitretin, cyclosporin, and corticosteroids) at least 6 weeks before the study, psoriasis vulgaris sufferers suffering from bipolar and schizophrenia disorders, and patients with psoriasis vulgaris using antidepressant drugs.

Biological studies

We measured BDNF serum level in Medan Private Laboratory using a Human BDNF kit (R & D®, USA) and ELISA method. To assess depression symptoms we used hospital anxiety and depression scale (HADS-D) questionnaire.

Statistical analysis

The collected data are processed by hypothesis analysis method to determine the degree of closeness of the relationships between variables. Analysis is done using data processing software.

Results

Process evaluation results and metrics

The relationship between BDNF serum level and depressive symptoms was analyzed by Spearman

correlation test. The result showed $p < 0.05$ indicates a significant relationship.

The subjects in the study were 46 patients with psoriasis vulgaris who came to the dermatology venereology clinic.

The results showed that the mean BDNF levels in this study were 912.45 ± 180.94 pg/ml.

The results showed that the mean HADS-D score in this study was 11.22 ± 2.52 .

The results show of the Spearman correlation test for BDNF's serum level and HADS-D obtained $p < 0.05$ and concluded that there was a correlation between BDNF's serum level and HADS-D. The strength of the relationship between BDNF's serum level and HADS-D is $r = -0.537$.

Discussion

The subjects in the study included were appropriate based on inclusion and exclusion criteria. The subjects in the study were 46 patients with psoriasis vulgaris who came to the dermatology venereology clinic. Subjects with male and female sex were included in this study. Based on the level of education they are divided into three types, junior high school, senior high school and college.

Based on the duration of illness of patients with psoriasis vulgaris there are those 2–5 years and over 5 years (Table 1).

In this study, it was found that the mean BDNF levels in this study were 912.45 ± 180.94 pg/ml (Table 2). Research conducted by Narbutt *et al.* reported that the mean BDNF level in patients with psoriasis vulgaris was 14.35 ng/ml. This mean did not differ significantly in patients with psoriasis vulgaris at 16.39 ng/ml ($p = 0.121$) [11].

A study from Brunoni *et al.* reported that the mean BDNF levels of patients with psoriasis vulgaris (3406 ± 3124 pg/ml) were more significantly lower ($p < 0.01$) compared to healthy controls (5947 ± 6300 pg/ml) [2].

This difference shows an interesting phenomenon for further research to prove whether BDNF has a very important role in the pathogenesis of psoriasis.

Before correlative testing at baseline data, the data normality test was performed which the HADS-D variable was tested for normalization using the Shapiro–Wilk test because the number of samples was < 50 (Table 3), and it was found that the HADS-D score, the variable was not normally distributed so that correlative baseline data using the Spearman correlation test. The results of the Spearman correlation test for

Table 1: Demographic characteristics

Variable	n	%
Age (years)		
20–29	6	13
30–39	14	30.4
40–49	14	30.4
50–59	10	21.7
≥60	2	4.3
Gender		
Male	24	52.2
Female	22	47.8
Education		
Junior high school	4	8.7
Senior high school	12	26.1
College	30	65.2
Duration of illness		
2–5 years	12	26.1
>5 years	34	73.9

BDNFs serum level and HADS-D obtained $p < 0.05$ and concluded that there was a correlation between BDNFs serum level and HADS-D. The strength of the relationship between BDNFs serum level and HADS-D, $r = -0.537$ shows moderate correlation ($r = 0.4 - < 0.6$).

Table 2: Brain-derived neurotrophic factor serum level

Subject (n)	Mean ± SD	Min-Max
46	912.45 ± 180.94	575.06–1227.62

Fatty *et al.* reported that there was lower BDNFs serum level in both groups of psoriasis (without depression 25.2 ± 6.5 ; with depression 16.9 ± 2.5) compared to the healthy control group (26.5 ± 3.6). BDNFs serum level was significantly lower in psoriasis vulgaris patients who suffered from depression compared to psoriasis patients who did not suffer from depression (mean difference 8.3; $p < 0.001$). BDNFs serum level was also significantly lower in psoriasis vulgaris patients who were depressed [12]. The mean of BDNFs serum level was significantly lower ($p < 0.01$) in the group of psoriasis patients who suffered from depression (16.9 ± 2.5) compared to depressed patients without psoriasis vulgaris (21.5 ± 5.8) [13].

Table 3: Hospital anxiety and depression scale-depression score

Subject (n)	Mean ± SD	Min-Max
46	11.22 ± 2.52	8–15

Korkoliakou *et al.* reported that there was no significant difference between depression with psoriasis vulgaris and healthy controls ($p = 0.28$) using the HADS depression measuring instrument [14].

Based on Yu and Chen study, the role of BDNF in the occurrence of depression is proved by four things. First, depression causes a decrease in BDNF levels in the hippocampus and prefrontal cortex. Second, depression triggers dendritic nerve atrophy in the hippocampus and prefrontal cortex. Third, there is evidence of increased levels of BDNF in the hippocampus and prefrontal cortex after antidepressant administration. Fourth, BDNF levels are increased in the amygdala and areas of neural accumbent that facilitates symptoms of depression [15].

This is in accordance with studies conducted based on the results from Table 4 which explains the

strength of the relationship in patients with psoriasis which is shown by the lower serum BDNF levels, it will improve depressive symptoms as indicated by the results of the HADS-D score.

Table 4: Correlation between BDNF serum level and HADS-D score

Serum levels of BDNF	
Score HADS-D	$r = -0.537$
	$p = 0.008$
	$n = 46$

*Spearman's correlation test. BDNF: Brain-derived neurotrophic factor, HADS-D: Hospital anxiety and depression scale-depression.

Conclusions

This study obtained the correlation coefficient ($r = -0.537$) with medium strength and significance value ($p = 0.008$). This shows a medium negative correlation between BDNFs serum level and the degree of depression's symptoms, which the lower BDNFs serum level will increase the degree of symptoms of depression.

Authors' Contributions

All authors contributed to the study and writing of the article. All authors have read and approved the final version of the manuscript. EE and MS contribute in collecting and analyzed data, EE and NU contribute in make the manuscript.

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Ethics Approval and Consent to Participate

This study has obtained ethical clearance from the ethical commission of the Faculty of Medicine,

Universitas Sumatera Utara, with number 609/TGL/KEPK FK USU – RSUP HAM/2016.

Availability of Data and Materials

That data will not be shared, the data required to reproduce these findings cannot be shared at this time due to ethical reason, technical, or time limitations.

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