



Published by DiscoverSys

# Analysis of nerve growth factor serum levels in psoriasis vulgaris patients



CrossMark

Riana Novatina E. Pangaribuan,<sup>1\*</sup> Imam B. Putra,<sup>2</sup> Kristo A. Nababan<sup>2</sup>

## ABSTRACT

**Background:** Psoriasis is a complex chronic inflammatory skin disease with multifactorial mechanism affected by immunological, genetic, environmental and nervous system factors which its mechanism is still unknown. The involvement of nervous system in psoriasis is ruled by nerve growth factor (NGF). Increased levels of NGF serum are expected occurring in psoriasis vulgaris.

**Aim:** To determine the differences between NGF serum levels in psoriasis vulgaris patients and controls

**Methods:** This study is an analytic study with cross sectional design involving 30 psoriasis vulgaris patients and 30 healthy controls. Diagnosis of psoriasis vulgaris was made based on history and clinical examination; we conducted blood sampling and measurement of NGF serum level to the patients and controls. The differences between NGF serum levels in psoriasis vulgaris patients and controlled is analyzed by independent-t test. This research approved by the health

research ethics committee of the Faculty of Medicine of Sumatera Utara University/ H. Adam Malik Medan General Hospital.

**Results:** In this study, we found the mean NGF serum level of female psoriasis vulgaris patients ( $810.30 \pm 299.97$  pg/ml) was higher compared to male ( $806.70 \pm 256.04$  pg/ml). The mean NGF serum of psoriasis vulgaris patients were highest on ages group 15 – 23 years ( $930.14 \pm 69.03$  pg/ml). The mean NGF serum level of psoriasis vulgaris without family history ( $875.38 \pm 203.91$  pg/ml) was higher compared to patient with a maternal history ( $600.87 \pm 387.45$  pg/ml) and paternal history ( $477.88 \pm 406.97$  pg/ml). The mean NGF serum level in the psoriasis vulgaris group ( $808.38 \pm 272.48$  pg/ml) was higher compared to the control group ( $524.92 \pm 281.22$  pg/ml) dengan with  $p=0.0001$ .

**Conclusion:** There were significant differences in NGF serum levels between psoriasis vulgaris patients and control.

**Keywords:** psoriasis vulgaris, serum nerve growth factor

**Cite this Article:** Pangaribuan, R.N.E., Putra, I.B., Nababan, K.A. 2019. Analysis of nerve growth factor serum levels in psoriasis vulgaris patients. *Bali Medical Journal* 8(2): 522-525. DOI:10.15562/bmj.v8i2.1446

<sup>1</sup>Postgraduate of Dermatovenerology, Faculty of Medicine, Sumatera Utara University, Medan, North Sumatera, Indonesia

<sup>2</sup>Department of Dermatovenerology, Faculty of Medicine, Sumatera Utara University, Medan, North Sumatera, Indonesia

## INTRODUCTION

The pathogenesis of psoriasis is still unknown; it is complex and multifactorial. There are clinical observations that show the correlation between the nervous system and the process of this disease, but it is still not fully understood.<sup>1</sup> An essential role of neurogenic inflammation in the pathogenesis of psoriasis is substantiated by some observations including exacerbations during periods of stress, marked proliferation of terminal cutaneous nerves and up-regulation of neuropeptides [substance P (SP), vasoactive intestinal peptide, calcitonin gene-related peptide (CGRP)].<sup>2,3</sup>

Nerve growth factor (NGF) is a family of neurotrophins that have an important role in the development, maintenance, and apoptosis nerve cells.<sup>2,4</sup> The binding of NGF and its receptors can lead to keratinocyte proliferation, angiogenesis, T cell activation, expression of adhesion molecules and increased neuropeptides that are known to have a role in psoriasis.<sup>2,5</sup>

psoriasis vulgaris and 30 healthy people as controls aged 15-65 years who came to the Dermatology and Venereology Polyclinic of H. Adam Malik Medan General Hospital. Inclusion criteria were subjects diagnosed as psoriasis vulgaris based on history and clinical examination and signed informed consent. Pregnant and nursing women, subjects using topical agent for treating psoriasis vulgaris (topical steroid, calcipotriol, tazarotene, tar) at least two weeks before examination and systemic agent (methotrexate, acitretin, cyclosporine, and corticosteroid) at least before examination were excluded. Ethical clearance with number of 42/TGL/KEPKFKUSU-RSUPHAM/2018 was given by Health Research Ethical Committee, Faculty of Medicine, University of Sumatera Utara.

The differences between NGF serum levels in psoriasis vulgaris patients and controlled is analyzed by independent-t test where the value of  $p \leq 0,05$  is considered a significant result.

## METHODS

This study was an observational analytic study with a cross sectional design involving 30 people who had

## RESULTS

In this study, we found the mean NGF serum level of female psoriasis vulgaris patients ( $810.30 \pm$

\*Correspondence to:  
Riana Novatina E. Pangaribuan,  
Postgraduate of Dermatovenerology,  
Faculty of Medicine, Sumatera Utara  
University, Medan, North Sumatera,  
Indonesia  
nvpangaribuan@gmail.com

**Table 1** Distribution of research subjects based on gender

Gender	Psoriasis vulgaris		Control		Total	
	n	%	n	%	N	%
Male	16	53,3	16	53,3	32	53,3
Female	14	46,7	14	46,7	28	46,7
Total	30	100	30	100	60	100

**Table 2** Distribution of research subjects based on age

Age (Years)	Psoriasis vulgaris		Control		Total	
	n	%	n	%	n	%
15 – 23	3	10	3	10	6	10
24 – 32	4	13,3	4	13,3	8	13,3
33 – 41	6	20	6	20,0	12	20
42 – 50	7	23,3	7	23,3	14	23,3
51 – 59	3	10	2	6,7	5	8,3
60 – 68	7	23,3	8	26,7	15	25
Total	30	100	30	100	60	100

**Table 3** Distribution of research subjects based on occupation

Occupation	Psoriasis vulgaris		Control		Total	
	N	%	n	%	n	%
Government employees	2	6,7	3	10	5	8,3
Private employees	5	16,7	6	20	11	18,3
Entrepreneur	9	30	8	26,7	17	28,3
College student	3	10	0	0	3	5
Unemployment	11	36,7	13	43,3	24	40
Total	30	100	30	100	60	100

**Table 4** Distribution of research subjects based on education

Education	Psoriasis vulgaris		Control		Total	
	N	%	n	%	n	%
Elementary	0	0	3	10	3	5
Junior high school	2	6,7	9	30	11	18,3
Senior high school	13	43,3	9	30	22	36,7
Graduate	14	46,7	9	30	23	38,3
Postgraduate	1	3,3	0	0	1	1,7
Total	30	100	30	100	60	100

**Table 5** Distribution of research subjects based on family history

Family history	Psoriasis vulgaris	
	n	%
Paternal	3	10
Maternal	3	10
None	24	80
Total	30	100

299.97 pg/ml) was higher compared to male (806.70 ± 256.04 pg/ml). The mean NGF serum of psoriasis vulgaris patients were highest on ages group 15 – 23 years (930.14 ± 69.03 pg/ml). The mean NGF serum level of psoriasis vulgaris without family history (875.38 ± 203.91 pg/ml) was higher compared to patient with a paternal history (477.88 ± 406.97 pg/ml). The mean NGF serum level in the psoriasis vulgaris group (808.38 ± 272.48 pg/ml) was higher compared to the control group (524.92 ± 281.22 pg/ml) dengan with p=0.0001.

## DISCUSSION

In this study, we found the mean NGF serum level of female psoriasis vulgaris patients (810.30 ± 299.97 pg/ml) was higher compared to male (806.70 ± 256.04 pg/ml). Based on online literature searches, researchers have not found a study of NGF serum levels in psoriasis vulgaris based on gender, but there are studies of gender-based NGF serum levels in healthy people. Lang et al conducted a study of 126 healthy people and found that NGF serum concentrations measured varied from 6.44 to 3589 pg/ml, with a mean NGF serum concentration of 19.68 pg/ml with an interquartile range of 11.06 - 41.47 pg/ml, which means that 50% of NGF serum levels are within this range. There were no statistically significant differences in the distribution of NGF serum concentrations between males and females (p=0.802).<sup>6</sup> Seranno et al. conducted a study on 157 healthy people, indicating that NGF levels were significantly higher in men (243±35 pg/ml) than in women (112±31 pg/ml).<sup>7</sup>

The mean NGF serum level based on the age of subjects were found on ages group 15-23 years. Based on online literature searches, researchers have not found a study of NGF serum levels in psoriasis vulgaris by age, but there are studies of age-based NGF serum levels in healthy people. In a study by Lang et al., it reported that there was no significant variation in NGF serum level based on the age in healthy volunteers.<sup>6</sup> Serrano et al. in their study obtained the mean NGF serum levels in humans was (194±25 pg/ml) and there was no significant difference based on age.<sup>7</sup>

The mean NGF serum level of psoriasis vulgaris without family history (875.38 ± 203.91 pg/ml) was higher compared to patient with a maternal history (600.87 ± 387.45 pg/ml) and paternal history (477.88 ± 406.97 pg/ml). Based on online literature searches, researchers have not found a study of NGF serum levels in psoriasis vulgaris based on a family history of psoriasis vulgaris.

**Table 6** NGF serum levels of psoriasis vulgaris based on gender

Gender	NGF serum levels (pg/ml)				
	N	Mean	SD	Min	Max
Male	16	806.70	256.04	188.55	1061.83
Female	14	810.30	299.97	57.36	1041.83

**Table 7** NGF serum levels of psoriasis vulgaris based on age

Age (years)	NGF serum levels (pg/ml)				
	n	Mean	SD	Min	Max
15 – 23	3	930.14	69.03	869.80	1005.42
24 – 32	4	850.80	231.19	506.49	989.21
33 – 41	6	846.11	273.34	305.87	1019.56
42 – 50	7	583.62	394.00	57.36	1041.10
51 – 59	3	884.49	119.47	746.62	957.40
60 – 68	7	891.76	168.28	656.68	1061.83

**Table 8** NGF serum levels of psoriasis vulgaris based on family history

Family History	NGF serum levels (pg/ml)				
	n	Mean	SD	Min	Max
Paternal	3	477.88	406.97	57.36	869.80
Maternal	3	600.87	387.45	188.55	957.40
None	24	875.38	203.91	305.87	1061.83

**Table 9** Comparison of mean values of NGF serum levels between psoriasis vulgaris patients with controls

Subject	n	Mean ± SD	Min - Max	P
Psoriasis	30	808.38 ± 272.48	57.36 – 1061.83	0,0001
Control	30	524.92 ± 281.22	70.12 – 1023.03	

\* Independent-t test

In this study, the mean NGF serum level in psoriasis group The mean NGF serum level in the psoriasis vulgaris group (808.38 ± 272.48 pg/ml) was higher compared to the control group (524.92 ± 281,22 pg/ml) with p=0.0001. In a study conducted by Herbrüggen et al. in 17 psoriasis patients, the median value of NGF serum in psoriasis patients was 17,6pg/ml (25th percentile 5.13 pg/ml, 75th percentile 13.16 pg/ml). There was no significant difference between NGF serum concentrations in healthy controls and NGF levels in patients who have psoriasis with p=0.059.<sup>8</sup> We found different results with their study.

Environmental and behavioral factors can influence the risk of developing or worsening psoriasis such as physical stress or psychological

stress.<sup>9</sup> Correlation based on clinical observations that stress exacerbates psoriasis suggests a role for nerves in the pathogenesis of psoriasis. The central nervous stress perception translated into peripheral tissues such as the skin is not only through the classical idea that stress triggers activation of the HPA axis but also through neurotrophins and neuropeptides whose regulation is increased by NGF.<sup>10</sup>

High expression of NGF found in the early stages of developing psoriasis lesions and tends to have a regulatory role in several prominent pathological psoriasis events such as keratinocyte proliferation, angiogenesis, T-cell activation, expression of adhesion molecules, skin nerve proliferation and increased regulation of neuropeptides.<sup>3</sup>

## CONCLUSION

There were significant differences in NGF serum levels between psoriasis vulgaris patients and control.

## CONFLICT OF INTEREST

The authors declare there is no conflicts of interest regarding this study. The author received no funding for this work.

## ACKNOWLEDGMENT

The author would like to thank to contributing author, Dr. dr. Imam B. Putra, MHA, Sp.KK and dr. Kristo A. Nababan, Sp.KK for their contribution in writing this article. Contributing author have same contribution equally except for manuscript preparation that the second contributing author did not have.

## REFERENCES

1. Raychaudhuri SP, Jiang WY, Farber EM. Psoriatic keratinocytes express high levels of nerve growth factor. *Acta Dermatol Venereol.* 1998;78:84–6
2. Botchkarev VA, Yaar M, Peters EMJ, Raychaudhuri SP, Botchkareva NV, Marconi A, et al. Neurotrophins in Skin Biology and Pathology. *The Society for Investigative Dermatology.* 2006; 126: 1719–27. doi:10.1038/sj.jid.5700270.
3. Raychaudhuri SP, Jiang WY, Raychaudhuri SK. Revisiting the Koebner Phenomenon Role of NGF and Its Receptor System in the Pathogenesis of Psoriasis. *The American Journal of Pathology.* 2008;172(4):961-71. doi: 10.2353/ajpath.2008.070710
4. Sofroniew MF, Howe CL, Mobley WC. Nerve Growth Factor Signaling, Neuroprotection and Neural Repair. *Annu. Rev. Neurosci.* 2001; 24:1217–281.
5. Raychaudhuri SP, Raychaudhuri SK. Role of NGF and neurogenic inflammation in the pathogenesis of psoriasis. *Progress in Brain Research.* 2004;146:433-7. doi: 10.1016/S0079-6123(03)46027-5

6. Lang UE, Gallinat J, Danker-Hopfe D, Bajbouj M, Hellweg R. Nerve Growth Factor serum concentrations in healthy human volunteers: physiological variance and stability. *Neuroscience Letters*. 2001;13-16
7. Serrano T, Lorigados LC, Armenteros S. Nerve growth factor levels in normal human sera. *Neuro report* 8. 1996;179-181
8. Herbruggen OS, Litzke J, Zingler C, Hoppner J, Vorchow JC, Hellweg R, et al. Maternal nerve growth factor serum levels in the perinatal period. *J Reprod Immunol*. 2007;74(1-2):170-3.
9. Vinod CA, Raychaudhuri SP. Geoepidemiology and environmental factors of psoriasis and psoriatic arthritis. *Journal of Autoimmunity*. 2010;34:314-321. doi:[10.1016/j.jaut.2009.12.001](https://doi.org/10.1016/j.jaut.2009.12.001)
10. Joachim RA, Kuhlmei A, Dinh Q, Handjiski B, Fischer T, Peters EMJ, et al. Neuronal plasticity of the "brain-skin connection": stress-triggered up-regulation of neuropeptides in dorsal root ganglia and skin via nerve growth factor dependent pathways. *J Mol Med*. 2007;85:1369-78. doi:[10.1007/s00109-007-0236-8](https://doi.org/10.1007/s00109-007-0236-8)



This work is licensed under a Creative Commons Attribution