Evaluation Of Neopterin Level And Disease Severity In Patients With Psoriasis Vulgaris Treated With Narrowband UVB

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Abstract

Background: Psoriasis is an immunity chronic hyperproliferative illness. An indicator of cellular immunity is neopterin, a biological substance. According to reports, psoriasis causes an increase in serum neopterin levels, which thereafter drop as a result of treatment.
Objectives: To evaluate serum levels of neopterin in patients with psoriasis vulgaris.
Patients and methods: This study is a case-control study that involved 30 patients with psoriasis and 30 healthy subjects as control. Patients were treated with Narrowband UVB (3session /week) for 3 months. Serum neopetrin levels were measured pre and post treatment by performing an enzyme-linked immune sorbent assay (ELISA). All patients were clinically and photographically evaluated using Psoriasis Area and Severity Index (PASI score).
Results: A Statistically significant differences in serum Neopterin level have been found in psoriatic patients comparing to healthy controls. The mean of serum Neopterin levels were 2.8 and 0.7 (nmol/L) in psoriatic patients and healthy controls, respectively (P< 0.001). We found Statistically significant improvement in disease severity, and a significant decrease in PASI scores was detected. The median of PASI score pre and post NB-UVB therapy was 31.4 and 8, respectively, with statistical significant difference (P<0.001). We noted significant difference between serum levels of Neopterin in patients before and after treatment, with a higher level of serum Neopterin among patients before treatment (P< 0.001).
Conclusion: Serum neopterin was highly significant in the psoriatic patients compared to healthy controls (p< 0.05). A significant decrease was observed in serum neopterin level after the narrowband UVB therapy.
Keywords: Serum neopterin, Psoriasis, PASI

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Introduction

Psoriasis is characterized by patches of aberrant skin caused by epidermal hyperproliferation, inflammation, and a noticeable influx of T lymphocytes, neutrophils, and macrophages which are the hallmarks of the chronic autoimmune cutaneous condition **(Menter et al., 2008).** Although there are five main kinds of psoriasis, plaque psoriasis affects 90% of sufferers. Other types include guttate, inverted, pustular, and erythrodermic psoriasis **(Boehncke & Schön, 2015).**

Psoriasis usually occurs in adulthood, but it can happen at any age. It has also been linked to depression, lymphomas, cardiovascular illness, Crohn's disease, and psoriatic arthritis. Up to 30% of people with psoriasis also have psoriatic arthritis **(Palfreeman et al., 2013).** 2-3% of people worldwide are affected by this chronic inflammatory disease. It is associated with hereditary susceptibility, autoimmune diseases, psychiatry and psychological well-being, or environmental elements like infection, stress, and trauma **(Grine et al., 2020**). The aetiology is intimately linked to aberrant stimulations of keratinocytes, T-cells, innate immunity, etc. Patients' immune systems secrete too many proinflammatory substances that trigger the nuclear factor-kappa B (NF-kB) signalling cascade and the development of T-helper (Th) cells into Th1 and/or Th17 cells, which uncontrollably activate the adaptive immune system **(Zhang & Wu, 2018).**

There are two categories of psoriasis treatment options: systemic and topical. The first group consists of immunity modulators and immune inhibitors, such methotrexate **(Goldenberg et al., 2016).** Ointments like calcipotriol and phototherapy are examples of topical treatments for mild to moderate psoriasis. As opposed to biological agents or other medications, phototherapy is a safe and effective treatment, especially for stable plaque psoriasis. It has no systemic side effects. Additionally, it can be combined with biologic medications to treat severe psoriasis **(Calzavara-Pinton et al., 2013).**

Because it reduces the amount of epidermal T lymphocytes and dendritic cells during treatment, narrow-band ultraviolet (NB-UVB) therapy is known to reverse various pathologic abnormalities in psoriasis **(Elghandour et al., 2013).** NB-UVB radiation therapy was discovered to target the IL-17 pathway in addition to its known function in decreasing IFN-production. One of the most successful treatments, particularly for those with moderate to severe psoriasis and widespread disease, is phototherapy **(Lapolla et al., 2011).**

Neopterin is a nonspecific indicator of cellular immunity, excreted from macrophages and monocytes upon stimulation with interferon-γ which is released from active T helper-1 (Th1) cells. Increased levels of neopterin within serum and urine were associated with psoriasis in published data **(Sánchez-Regaña et al., 2000).** The aim of our study was to evaluate serum level of neopterin pre and post NB –UVB therapy in patients with psoriasis vulgaris

Patients and methods

Thirty Egyptian patients with clinically evident psoriasis and equal number of healthy volunteers as control group were enrolled in the study.

Participants were divided randomly into two groups:

1. **Group (A)**: 30 patients were treated with NB-UVB.
2. **Group (B):** 30 healthy persons as control group.
3. **Sample size calculation** :

$$n = \frac{Z^2 p(1-p)}{d^2}$$

Ethical approval code: SVU-MED-DVA021-2-21-6-209
Inclusion criteria included: Patients between the ages of 16 and 60 years proved having psoriasis.
Exclusion criteria included patient with history of photosensitivity, patients having liver or renal disease and Patient receiving immune suppressive drugs.
The study was approved by Qena Faculty of Medicine institutional ethical committee. All patients signed an informed consent before their inclusion in this study.
All patients underwent the following:
All patients were subjected to the following:

I. History and Clinical Examination: -

1- Complete history taking, including history of duration of psoriasis, its course, previous therapies used, history of comorbid conditions such as DM, HTN and cardiac disease.

2- Full Clinical Examination.

3- Body mass index (BMI) was registered using waist circumference (WC), height, and weight data.

II. Laboratory Investigations: -
Blood sampling: Five milliliters of venous blood were collected from all participants and divided into two samples; the first (3 ml) was collected in a plain vacationer tube, centrifuged, and the resulting sera were used for biochemical investigations, the second (2ml) was collected into an EDTA tube used for CBC and HbA1c assay.

Blood collection: Five millilitres of venous blood from each participant was drawn and divided into two samples; the first (3 ml) was placed in a plain vacationer tube, centrifuged, and the resulting sera were used for biochemical research; the second (2 ml) was placed in an EDTA tube and used for the CBC and HbA1c assay.

1. Complete blood picture by Erma Automated Blood Count Machine (Tokyo, Japan).

2. Total cholesterol (TC), triglycerides (TG), low-density lipoprotein cholesterol (LDL-C), and high-density lipoprotein cholesterol (HDL-C) were taken for lipid profile. Using the Beckman Coulter (Synchron CX 9 ALX) Clinical Auto Analyzer, and creatinine were assessed in the blood (Beckman Instruments, Fullerton, California, USA).

3. The COBAS 501 chemistry auto analyzer was used to estimate serum creatinine (Roche Diagnostics, USA).

4. Serum neopetrin levels were measured pre and post treatment by performing an enzyme-linked immune sorbent assay (ELISA).

III. Treatment protocols:

- **Group (A)**: 30 patients were subjected to treatment by NB-UVB. The patient's skin type was taken into consideration while calculating the initial radiation dose, and this dose was then increased by 20% per session. Three months' worth of sessions were provided three times per week on different days. Utilizing an EU WaldmannF85/100W-UV01 cabinet with WaldmannUV5000 tubes.

IV. Follow-up

- The severity of psoriasis were assessed by Psoriasis Area and Severity Index (PASI score): the score was calculated for psoriatic patients at the first visit and 12 weeks after treatment **(Feldman SR et al., 2005**)

Statistical analysis

Version 26.0 of the Statistical Software for Social Sciences (SPSS) was used to analyze the data. Using the Student's t-test, quantitative data were compared as mean standard deviation (M SD). Quantitative information was presented as frequency and percentage number (%) and. To compare non-parametric data, the chi-square test was applied. Significant was defined as P 0.05.

Results

The distribution of sociodemographic factors was illustrated in (**Table 1).** Cases and controls were matched for all sociodemographic factors. The mean age of the studied group was 40.4± 5.8 years with 46.4% males and 53.6% females, for the cases group, and the mean age was 41.6 ± 13.9 years with 53.3% males for the control group.

In the current study, statistically significant differences in serum neopterin level have been found in psoriatic patients comparing to healthy controls. The mean of serum neopterin levels were 2.8 and 0.7 (nmol/L) in psoriatic patients and healthy controls, respectively (P< 0.001) **(Table 2).**

In the current study, we found statistically significant improvement in disease severity, and a significant decrease in PASI scores was detected. The median of PASI score pre and post NB-UVB therapy was 31.4 and 8, respectively, with statistical significant difference (P<0.001) **(Table 3).**

In the current study, we found highly significant difference between serum levels of neopterin in patients before and after treatment, with a higher level of serum Neopterin among patients before treatment (P< 0.001). The median value of the serum neopterin of the patients group was 2.8 nmol/L and 1.04 nmol/L before and after therapy, respectively with statistically significant difference between them (P<0.001) (**Table 4).**

Table 1. Demographic and Clinical Characteristics of the studied Groups

Variables	Control (No.=30)	Case (No.=28)	P-value
Age (Mean ± SD)	41.6 ± 13.9	40.4 ± 5.8	0.671
Sex			
• **Male**	16 (53.3%)	13 (46.4%)	0.599
• **Female**	14 (46.7%)	15 (53.6%)	
Marital Status			
• **Unmarried**	8 (26.7%)	5 (17.9%)	0.662
• **Married**	20(66.7%)	20 (71.4%)	
• **Divorced**	2(6.7%)	3(10.7%)	
BMI (Mean ± SD)	28.3 ± 3.1	28.9 ± 3	0.454
SES			
• **Low**	14 (46.7%)	13 (46.7%)	0.988
• **Moderate**	16 (53.3%)	15 (53.3%)	
Residence			
• **Rural**	16 (53.3%)	12 (42.9%)	0.425
• **Urban**	14 (46.7%)	16 (57.1%)	

Smoking Status			
• **Non-smoker**	**17 (56.7%)**	**16 (57.1%)**	**= 0.971**
• **Smoker**	**13 (43.3%)**	**12 (42.9%)**	

Table 2. Comparison between cases and controls regarding Neopterin level

Variable	Control (No.=30)	Case (No.=30)	P-value
S. Neopterin level (nmol/L)			
• **Mean ± SD**	0.70 ± 0.3	2.8 ± 0.7	< 0.001*
• **Median (Range)**	0.6 (0.3-1.3)	2.4 (1.9-3.8)	

Table 3. Effect of Treatment on the PASI Score

Variables	PASI Score (Pre.)	PASI Score (Post.)	T value	P-value
Cases	31.40 ± 6.5	8 ± 2.3	24.4	0.000*
PASI Reduction%	74.5%			

Table 4. Effect of Treatment on the serum neopterin level

Variables	Neutropin Score (Pre.)	Neutropin Score (Post.)	T value	P-value
Cases	2.80 ± 0.67	1.04 ± 0.24	12.6	0.000*
Nuetropin Reduction%	62.9%			

Discussion

In comparison to healthy controls, the present study revealed statistically significant variations in the serum neopterin levels of psoriatic patients.

The results of the current study were analogous to those of Ishaq et al., who demonstrated that the mean s. neopterin levels in the sick group were substantially higher (p0.001) than those in the healthy controls. The results of the study showed that the creation and maintenance of psoriatic lesions contributed to the increase of s. neopterin's role in the pathogenesis of psoriasis **(Ishaq et al., 2017).**

Forty people with psoriasis and 37 healthy controls were included in Ceyhan et al. study. In the sick group compared to the healthy controls, the mean values of s. neopterin levels were substantially higher (p 0.001). They suggested that s. neopterin may be utilised as a trustworthy immunological marker for assessing the severity of psoriasis **(Ceyhan et al., 2011).**

In the current study, we found statistically significant improvement in disease severity, and a significant decrease in PASI scores after treatment with NB-UVB was detected in patients groups.

The current results were in agreement with **Budamakuntla et al.** who conducted a prospective longitudinal study on 28 psoriasis patients and 10 controls. PASI scoring was estimated at baseline and after 12 weeks. Baseline PASI score was significantly reduced after NB-UVB Phototherapy **(Budamakuntla et al., 2017)**. In accordance with this study, **El-Refaei and El-Esawy** conducted a case control study, included 40 patients with moderate to severe chronic plaque psoriasis compared with control group (n=20) apparently healthy persons. A significant improvement in PASI scores was observed (**El-Refaei and El-Esawy,**

2015). Similarly, in a study by **Ala‑Houhala *et al*.,** after treatment with NB‑UVB, PASI score was improved with significant values (**Ala‑Houhala et al., 2014**). **Gupta et al.** evaluated 30 patients presenting with psoriasis and 30 healthy controls and found significant improvement in PASI score after treatment **(Gupta et al., 2016).**

There was significant difference in the mean s. neopterin level after treatment ($p < 0.001$) in compared to pretreatment.

Neopterin level and PASI score showed a statistically significant link in a recent study by Kemeriz et al. Following NB-UVB therapy, s. neopterin level was found to have significantly decreased **(Kemeriz et al., 2019).**

Conclusion

When compared to healthy controls, serum neopterin was significantly higher in psoriatic patients (p 0.05). Serum neopterin levels were found to have significantly decreased following narrowband UVB therapy.

Limitations of this study

- Small sample size
- Brief study duration (12 weeks)
- Variable time intervals between data collection points
- Long-term impact on social or emotional domains not well known

References

- **Ala‑Houhala MJ, Karppinen T, Vähävihu K, Kautiainen H, Dombrowski Y, Snellman E, et al.(2014).** Narrow‑band ultraviolet B treatment boosts serum 25‑hydroxyvitamin D in patients with psoriasis on oral vitamin D supplementation. Acta Derm Venereol, 94:146‑51.
- **Boehncke WH, , Schön MP. (2015):** Psoriasis. Lancet, 386, 983–994.
- **Budamakuntla L, Loganathan E, Gundappa P, Sreelakshmi KT. (2017).** IL 17 cytokine in psoriasis: before and after methotrexate and NBUVB phototherapy: a longitudinal study. Clin Dermatol Res, J 2, 1, 2.
- **Calzavara-Pinton P G, Sala R, Arisi M, Rossi MT, Venturini M, Ortel B. (2013).** Synergism between narrowband ultraviolet B phototherapy and etanercept for the treatment of plaque-type psoriasis. The British Journal of Dermatology, 169, 130–136.
- **Ceyhan AM, Yıldırım M, Ceyhan BM, Sütçü R.(2012).** Serum Neopterin and TNF-α Levels in Psoriasis and Their Correlation with Disease Severity. Türk derm, 46: 7-10.
- **Ele-Refaei A , El-Esawy F. (2015).** Effect of Narrow-Band Ultraviolet B Phototherapy and Methotrexate on MicroRNA (146a) Levels in Blood of Psoriatic Patients. Dermatology Research and Practice, 2015; 1-5.
- **Elghandour T, Youssef S, Aly D, Abdelhamid M , Abdelmoneim M (2013).** Effect of narrow band ultraviolet B therapy versus methotrexate on serum levels of IL17 &IL23 in patients with severe psoriasis. Dermatology Research and Practice,10:1155-1161.
- **Goldenberg G, Lanoue J, Dong J (2016):** New oral therapies for psoriasis: A comprehensive review. The Journal of Clinical and Aesthetic Dermatology, 9, 25–28.
- **Grine L, Tochtermann G, Lapeere H, Maes N, Hofbauer GFL, Vervaet M, Lambert J. (2020).** Comparison of personality traits among patients with psoriasis, atopic dermatitis, and stress: A pilot study. Dermatology, 5, 1–5.
- **Gupta A, Arora TC, Jindal A, Bhadoria AS. (2016).** Efficacy of narrowband ultraviolet B phototherapy and levels of serum vitamin D3 in

psoriasis: A prospective study. Indian Dermatol Online J. 7:87-92.

- **Ishaq SE, Rasheed TK, Salih FA (2017).** Immunological Evaluation of Psoriatic Patients In Erbil City/Iraq. ZJPAS. 29 (6); 59-67.
- **Kemeriz F, Gönül M, Cengiz FP, Emiroğlu N, Cemil BÇ. (2019).** Evaluation of neopterin level and disease severity in patients with psoriasis vulgaris treated with narrowband UVB. Indian J Dermatol. 64:447-50.
- **Lapolla W, Yentzer BA, Bagel J, Halvorson CR and Feldman SR. (2011).** A review of phototherapy protocols for psoriasis treatment. J Am Acad Dermatol, 64:936–949.
- **Lapolla W, Yentzer BA, Bagel J, Halvorson CR, Feldman SR. (2011).** A review of phototherapy protocols for psoriasis treatment. Journal of the American Academy of Dermatology, 64, 936–949.
- **Sánchez-Regaña M, Catasús M, Creus L, Umbert P. (2000).** Serum neopterin as an objective marker of psoriatic disease activity. Acta Derm Venereol, 80: 185-187
- **Feldman SR, Krueger GG. (2005). Psoriasis assessment tools in clinical trials**. Ann Rheum Dis, 64:65–8.
- **Menter A, Gottlieb A, Feldman SR, Van Voorhees AS, Leonardi CL, Gordon KB, et al. (2008).** Guidelines of care for the management of psoriasis and psoriatic arthritis: Section 1 Overview of psoriasis and guidelines of care for the treatment of psoriasis with biologics. Journal of the American Academy of Dermatology, 58: 826–850.
- **Palfreeman AC, McNamee KE, & McCann FE. (2013).** New developments in the management of psoriasis and psoriatic arthritis: A focus on apremilast. Drug Design, Development and Therapy, 7: 201–210
- **Zhang P , Wu MX. (2018).** A clinical review of phototherapy for psoriasis. Lasers in Medical Science, 33: 173–180.