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# Selenium Level in Lichen Planus and in Psoriasis and Its Relation to Chronicity and Severity of Both Diseases

**Nadheer A. Matloob** *FICMS; CABD*

Dept. Medicine, Dermatology Section, College of Medicine, Al-Nahrain University.

## Abstract

**Background** Lichen planus characterized by its violaceous color most commonly seen on the flexor surfaces of the upper extremities, the genitalia and the mucous membranes. Psoriasis is a common, chronic, relapsing, inflammatory skin disorder with a strong genetic basis. Plaque type of psoriasis is the most common. Selenium is a component of the enzyme glutathione peroxidase, and is important in protection against damage by peroxides and free radicals.

**Objectives** To measure selenium level in Iraqi patients with lichen planus and in patients with psoriasis and its relation to the chronicity and the severity of both diseases.

**Methods** One hundred twenty patients were included in this study, 68 males and 52 females, with ages between 18-54 years. Full history and examination, including dermatological examination, were done for all patients. The patients were divided into three groups. The first group includes lichen planus patients, the second group includes psoriasis patients and the third group was a control group study. Serum selenium level was measured for all patients by spectrophotometer.

**Results** Serum selenium level was decreased in 20 (50%) patients of the first group, in 32 (80%) patients of the second group and 14 (35%) of the third group. The results were of high statistical significance when compared between groups 2 & 3 but it was insignificant when compared between groups 1 & 3. Selenium level was decreased in 12 of the first group who had the disease for two years and above while it was decreased in 18 of the second group who had psoriasis for two years and above, selenium level was decreased in patients with severe and diffuse variants of both lichen planus and psoriasis.

**Conclusion** Serum selenium level was decreased in both lichen planus and psoriasis but it was more significant in psoriasis and this decrease was related to both chronicity and severity.

**Keywords** Selenium, Lichen planus, Psoriasis, Chronicity, Severity.

## Introduction

Lichen planus (LP) is a fairly common skin disorder presented with a pruritic, papular eruption characterized by its violaceous color, polygonal shape and sometimes, fine scales.

Lichen planus is most commonly found on the flexor surfaces of the upper extremities, the genitalia and the mucous membranes especially the oral cavity [1,2]. Lichen planus is most likely an immunologically mediated reaction of unknown origin. No significant geographical variation in frequency was noted. No racial predispositions have been noted. No significant differences in incidence are noted between male and female patients, but in women, lichen planus may present as desquamative inflammatory vaginitis [3].

More than two thirds of patients are aged 30-60 years; however, lichen planus can occur at any age [4]. Many clinical variants of the disease are present (according to the morphology or the areas of involvement) [1,2]. Psoriasis is a common, chronic, relapsing, inflammatory skin disorder with a strong genetic basis. Plaque type of psoriasis is the most common, although several other distinctive clinical variants of psoriasis are recognized (Guttate Psoriasis; Pustular Psoriasis; Psoriatic Arthritis; flexural Psoriasis; Erythrodermic Psoriasis ... etc)[5,6]. Plaque psoriasis is most typically characterized by circular-to-oval red plaques distributed over the extensor body surfaces and the scalp. The plaques usually exhibit scaling as a result of epidermal hyperproliferation and dermal inflammation. The extent and duration of plaque psoriasis is highly variable from patient to patient. Acute flares or relapses of plaque psoriasis may also evolve into more severe disease, such as pustular or erythrodermic psoriasis [1,7]. Psoriasis affects adult males and females equally. Plaque psoriasis first appears during two peak age ranges. The first peak occurs in persons aged 16-22 years, and the second occurs in persons above 50 years [8].

Selenium (Se) is one of the trace elements, which include in addition, iron, copper, iodine, chromium and zinc. All of them are required for physiological functions in amounts less than 100 mg daily [9]. Normal serum concentration of selenium is 80-130 µg/l [10]; the concentration of selenium in blood is highly responsive to changes in the selenium level in the diet over a wide range [10]. Supplemental selenium has restored cell proliferation defects associated with aging mice by increasing the number of high affinity IL-2 receptors and improved T-cell response to phytohaemoagglutination and significant progressive increase in delayed type hypersensitivity in hemodialysis patients [11]. Selenium is a component of the enzyme glutathione peroxidase, and is important, together with vitamin E, in protection against damage by peroxides and free radicals (it is important for the integrity of the immune system in human body). Selenium acts as anti toxic element, can binds cadmium, mercury and other metals, it mitigates their toxic effect, and even the toxic level in tissues remain unchanged. On the other hand selenium may be toxic when ingested water containing a high amounts of the metal [12,13]. Some studies indicate that selenium can be useful in the treatment of acne and it also helps in treatment and prevention of dandruff and some other skin disorders [14]. Many studies showed the relation between selenium level and psoriasis, but no known study was done to show the relation between selenium level and lichen planus and so this study was performed to measure selenium level in Iraqi patients with lichen planus and in patients with psoriasis and its relation to the chronicity and the severity of both diseases.

## Methods

One hundred twenty patients were included in this study, 68 (56.7%) of them were males and 52 (43.3%) were females, with ages between 18-54 years and a mean age of 35.7±10.8 years. The study was conducted from July 2007 till the end of December 2009 in the Department of Dermatology of Al-Kadhymia Teaching Hospital in Baghdad.

Three groups were present in this study and each one contained 40 patients, the first one included patients with lichen planus, the second included patients with psoriasis and the third was a control group. The diagnosis of both diseases was done depending on the clinical bases. Full history was obtained from each patient including age, occupation,

duration of the disease (regarding both LP and psoriasis), history of treatments (for both diseases), also full examination, including dermatological examination, were done for all patients by the same dermatologist. Some patients needed full biochemical investigations according to the clinical variants of the two dermatoses and some of them needed skin biopsy to settle the diagnosis.

***Methods of determination of serum selenium:***

A (5 ml) sample of blood were taken from all study subjects and allowed to clot then centrifuged at 3000 rpm for 5 minutes. The clear serum was transferred to a plastic tube by disposable syringe and tapped by a plastic stopper, then stored a deep frozen at -20 °C before analysis (all glassware and bottles used for the isolation of serum and for analysis were previously soaked in diluted nitric acid (10%) and rinsed thoroughly with de-ionized water, this procedure was followed in order to exclude the possibility of contamination with trace elements). Serum was aliquoted into a vessel-tube for mineralization with 5 ml of $HNO_3$/$HCLO_4$ (4:1 v/v). The temperature of this mixture was slowly increased to 175 °C until fumes of $HCLO_4$ appeared. The mixture was then heated according to the following (temperature/time) scheme: 175 °C/60 min, 200 °C/60 min and finally 250 °C for 60 min. The mixture was then left to cool down to room temperature. HCL 6 N (10 ml) was added and heated to 170 °C for 30 min to reduce the Se (VI) to Se (IV). After cooling to room temperature, Se concentration was determined using the hydride generation atomic absorption spectrophotometry (Atomic absorption spectrophotometer Shimadzu, AA-680). Sodium bromohydride solution (3 g $NaBH_4$, 1 g NaOH in 100 ml of mili-Q water) was used as a reducing agent. Samples were diluted (1:4) with de-ionized water and measured directly at 196 nm. A standard curve was made from dilutions solution of 1 mg/ml [(15)].

***Statistical analysis***

Continuous variables were expressed as mean and standard deviation. Categorical variables were expressed as percentages. Descriptive characteristics of patients were compared using $\chi 2$ tests with Yate's correction for continuity. All database management and statistical analyses were performed with SPSS software ($10^{th}$ version). The level of significance was set at (*p*-value < 0.05). All probability values were two-sided [(16)].

## Results

Duration of LP in group 1 patients was between one month & 5 years while the duration of psoriasis in group 2 patients was between two weeks & 15 years.

Selenium level shown to be decreased in 20 (50%) patients of the $1^{st}$ group (patients with LP), in 32 (80%) patients of the $2^{nd}$ group (patients with psoriasis) and 14 (35%) of the $3^{rd}$ group (control), (selenium level was between 40 and 70 µg/l in those patients and was 80 µg/l and more in patients with normal selenium levels) and the results were of high statistical significance when compare between groups 2 and 3 but it was insignificant when compare between groups 1 and 3 (Table 2 and Figure 1).

Selenium level was decreased in 12 of the 1st GP Patients who had LP for two years and above, while it decreased in 18 of the 2nd GP Patients who had psoriasis for two years and above, also selenium level decreased in patients with severe and diffuse variants of both LP and psoriasis (eruptive, ulcerative and diffuse lichen planus as well as

erythrodermic psoriasis, generalized pustular psoriasis (GPP), psoriatic arthritis and diffuse plaque psoriasis) (Tables 3, 4 and 5).

**Table 1: The age and the sex of the patients**

| Age (Years) | L.P | M | F | Psoriasis | M | F | Control | M | F | Total | % |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 - < 20 | 4 | 2 | 2 | 5 | 3 | 2 | 3 | 2 | 1 | 12 | 10 |
| 20 - < 30 | 6 | 4 | 2 | 7 | 4 | 3 | 10 | 5 | 5 | 23 | 19.2 |
| 30 - < 40 | 14 | 8 | 6 | 13 | 8 | 5 | 11 | 6 | 5 | 38 | 31.7 |
| 40 - < 50 | 10 | 5 | 5 | 9 | 5 | 4 | 11 | 6 | 5 | 30 | 25 |
| 50 - < 60 | 6 | 3 | 3 | 6 | 4 | 2 | 5 | 3 | 2 | 17 | 14.1 |
| Total | 40 | 22 | 18 | 40 | 24 | 16 | 40 | 22 | 18 | 120 | 100 |
| Mean age | 36.7 ± 10.4 | | | 35.7 ± 10.9 | | | 35.4 ± 10.8 | | | 35.7 ± 10.8 | |

**Table 2: The decrease in selenium level in relation to the three groups**

| Group | Decrease in selenium level (40-70mcg/l) | % | Normal selenium level (≥ 80mcg/l) | % | *p*-value | Chi-square |
|---|---|---|---|---|---|---|
| 1st group | 20 | 50 | 20 | 50 | 0.2581 | 1.279 |
| 2nd group | 32 | 80 | 8 | 20 | 0.0001* | 14.783 |
| 3rd group | 14 | 35 | 26 | 65 | - | - |

* Values considered statistically significant when P - value < 0.05 (Compare both the 1st and the 2nd group with the 3rd group).

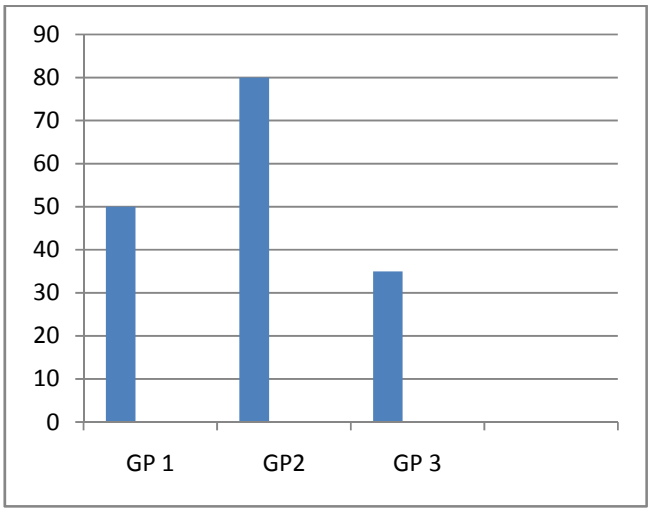


**Figure 1: The decrease in selenium level in relation to the three groups**

**Table 3: The decrease in selenium level in relation to the duration of both diseases**

| Group | < 1 Year | 1 – 2 Years | > 2 years |
|---|---|---|---|
| | No. | No. | No. |
| Lichen planus | 2 | 6 | 12 |
| Psoriasis | 4 | 10 | 18 |

**Table 4: The decrease in selenium level in relation to the severity (variant) of Lichen planus**

| Clinical Variant | Decreased level | Normal level | Total |
|---|---|---|---|
| Classical | 14 | 12 | 26 |
| Actinic | 1 | 5 | 6 |
| Eruptive | 3 | 1 | 4 |
| Ulcerative | 2 | - | 2 |
| Hypertrophic | - | 1 | 1 |
| Atrophic | - | 1 | 1 |

**Table 5: The decrease in selenium level in relation to the severity (variant) of Psoriasis**

| Clinical Variant | Decreased level patients | Normal level patients | Total patients |
|---|---|---|---|
| Plaque Diffuse | 18 | 8 | 26 |
| plaque | 5 | - | 5 |
| Erythrodermic | 3 | - | 3 |
| Psoriatic arthritis | 3 | - | 3 |
| GPP | 3 | - | 3 |

## Discussion

Selenium is considered as one of the important trace elements that had important functions in human including its relation to the immune system and its action as an antioxidant and antitoxic material [(17)]. Selenium have relation to many common skin diseases like psoriasis, eczema, dandruff ….etc [(14)] (especially those dermatoses with immune aspects in their pathogenesis) and to the best of our knowledge, this study is the first in Iraq regarding the relation between selenium and psoriasis as well as its duration and severity; it was also the first study in Iraq and even in the literature regarding the relation between selenium and lichen planus as well as its duration and severity.

Generally, this study clearly showed that there is an inverse relationship between the level of selenium and the duration of both LP and psoriasis and the explanation of this reduction in selenium level is that selenium itself has a fundamental role in the regulation of the immune system and any decrease in the level of selenium will cause a change in the immune system, and this will affect LP and psoriasis which both had an immune etiology, [(13)] and this study also showed that patients with lichen planus had a 50% decrease in selenium level but this result was statistically insignificant in comparison with the control group (35%) and this may be due to the relatively small number of LP patients or due to the increase in the deficiency in selenium in Iraqi people in general due to many years of sanctions and blockade, however, the more the chronic and the more diffuse and sever LP was, the more the decrease in selenium level was seen. This recent study also showed that selenium level

had a significant inverse relation to psoriasis as well as to its duration, variants and severity and this point is in agree with Serwin et al study [18] which showed the same findings, however, this old study showed a relation of selenium level to psoriasis of more than three years duration and this differs from this study which showed that selenium level was decreased even in psoriatic patients who had less than one year history of the disease and this difference may be due to the differences in the etiopathogenic or the provoking factors of psoriasis from country to country and also (as mentioned before)due to the fact that Iraqi people may already had deficiency in selenium because of the years of sanctions and blockade [18]. This study was also in agreement with Hinks et al study [19] which showed a significant inverse relationship between selenium level and psoriasis, however, this recent study differs from Donadini et. al. study [20] that showed the absence of relation between selenium level and psoriasis and this difference may be due to (and as mentioned before) the differences in the etiopathogenic or the provoking factors from country to country as well as the differences in the number of the patients and the clinical variants of the disease in the study. The relation between the clinical variants of psoriasis and selenium level that was mentioned in this study was not shown in the literature, however, many studies abroad claimed that psoriasis may be improved by the use of selenium supplements [21,22] but no such studies were found regarding lichen planus.

Selenium level was decreased in both LP and psoriasis but it was more significant in psoriasis and this decrease was related to both chronicity and severity.

## Recommendation

Other studies with a higher number of patients and with more clinical variants of both LP and psoriasis are needed to get more accurate results about the relation between the two diseases and selenium, a future studies about the effects of selenium supplements on both LP and psoriasis and studies about other trace elements in relation to both disease as well as other skin diseases are needed.

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**Correspondence to: Dr. Nadheer A. Matloob,**
**E-mail: ndnav36@yahoo.com**
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