



Evaluation of Serum Copper, Zinc and Copper/Zinc Ratio in Psoriatic Patients

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ABSTRACT

Backgrounds: Psoriasis is a hyper proliferative coetaneous disease of multi-factorial etiologies, genetic background, environmental factors, vascular and immune system disturbances. Copper and zinc are very importance trace elements and essential to biochemical processes in the body and are involved in immunological and inflammatory reactions.

Objective: The objective of the present study was to evaluate the relationship between zinc (Zn) and copper (Cu) ion and copper/zinc with the pathogenesis of psoriasis disease.

Materials and Methods: an analytical case control hospital based study conducted in Khartoum dermatology and venerology teaching hospital, Khartoum state, Sudan. During the period from September to December 2018. A total of 100 subjects were enrolled in the study, 50 psoriatic patients as case group and 50 apparently healthy as control group with match age and sex. The age ranged from 12 and 60 years and their average mean 32 years. Three ml of venous blood were collected from each volunteer, serum was obtained and analyzed using colorimetric method in fully Automated Biochemistry Analyzer and the data was analyzed using SPSS version (21). P-value of <0.05 was considered significant. And also psoriatic patients the severity of psoriasis was assessed by 'Psoriasis Area Severity Index' (PASI score).

Results: The study revealed a significantly increase ($p = 0.000$) of serum copper in psoriatic patients compared to control group and a significantly decrease ($p = 0.040$) of serum zinc in psoriatic patients compared to control group. And the copper/ zinc was significantly increase ($p = 0.000$) in patients than controls. Moreover, serum copper was significantly increased ($p = 0.012$) in psoriatic patients infected >1 year compared to patients

infected 6 months to 1 year. The serum zinc was significantly decreased ($p = 0.030$) in psoriatic patients infected >1 year compared to patients infected 6 month-1 year. And also the copper/ zinc significantly increased ($p = 0.027$) in psoriatic patients infected >1 year compared to patients infected 6 month to 1 year. The serum copper was a significantly different ($p = 0.001$) between severity of psoriatic disease compared to mild and moderate. Moreover, the serum zinc was significantly different ($p = 0.001$) between mild and moderate and also a significantly different ($p = 0.022$) between severity of psoriatic disease compared to mild and moderate. The copper/ zinc was a significantly different ($p = 0.000$) between severity of psoriatic disease compared to mild and moderate.

Conclusion: The psoriatic patients had a significantly increased serum copper, copper/ zinc and a significantly decrease of serum zinc. The study observed that, the common in male than female and also in moderate a stage of severity.

KEYWORDS

Serum zinc, copper, Zinc ratio, Psoriasis

INTRODUCTION

Psoriasis is a common chronic inflammatory skin disease and is primarily characterized by localized or generalized scaly erythematous plaques. The rapid proliferation of epidermal keratinocytes in the basal layer is the primary pathological characteristic of psoriasis⁽¹⁾. The worldwide prevalence of psoriasis varies in different countries, ranging from 0.6% to 4.8%⁽²⁾. It shows a lower prevalence in Asian and some African populations, and up to 11% in Caucasian and Scandinavian populations⁽³⁾. Psoriasis can develop at any age, but incidence peaks between 15 and 30 years of age and there is no significant difference in psoriasis incidence between men and women⁽²⁾. The etiology of psoriasis remains unclear, although there is evidence for genetic predisposition⁽⁴⁾. The role of the immune system in psoriasis causation is also a major topic of research, although there is suggestion that psoriasis could be an autoimmune disease, no auto antigen that could be responsible has been defined yet, therefore psoriasis can also be provoked by external and internal triggers, including mild trauma, sunburn, infections, systemic drugs and stress⁽⁵⁾. The pathogenesis of psoriasis is still poorly understood. It results from the interactions between genetic predisposition and a large spectrum of environmental risk factors, such as diet, alcohol consumption, stress, obesity, smoking⁽⁶⁾. The dermatologic manifestations of psoriasis are varied, therefore clinically there are many types: psoriasis vulgaris About 90% of psoriasis cases, inverse psoriasis, guttate psoriasis and pustular psoriasis⁽⁷⁾. It ranges in severity from a few plaques to involvement of almost the entire body surface⁽⁸⁾. Numerous studies have shown that abnormal serum Cu and Zn levels are important mechanisms underlying the occurrence and development of skin diseases. Cu and Zn deficiencies reduce the activity of enzymes related to melanin synthesis, thereby causing a reduction in melanin production an aggravating white spots or patches of vitiligo⁽⁹⁾. Cu and Zn abnormalities are also involved in the pathophysiology of psoriasis⁽¹⁰⁾. Studies have reported that serum Cu levels were increased in patients with psoriasis⁽¹¹⁾, whereas serum Zn levels were decreased⁽¹²⁾. The current study conducted to evaluate serum copper, zinc and copper, zinc ratio in psoriatic patients.

Subjects and Methods

Study Setting:

An analytical case control hospital based study was conducted in Khartoum dermatology and venerology teaching hospital at Khartoum state during period from September to December 2018. Fifty psoriatic patients attended from the dermatology outpatient clinic (33 males & 17 females) and 50 apparently healthy individuals (31 males and 19 females) their age ranged from 12 and 60 years with average age was 32 years.

Inclusion / exclusion Criteria:

Patients diagnosed with psoriasis, were included in this study. Patients with age less than 10 years, pregnancy, lactation, liver or kidney disease, phototherapy, any immunosuppressive drugs including topical or systemic corticosteroids, methotrexate,

retinoid or vitamins were stopped for at least the last 4 weeks before initiation of this study.

Investigations and data collection:

Fasting blood specimens were collected in the morning between 9- 12 hours, and centrifuged for 10 minutes at 3500rpm. All the precautions were taken in accordance with the Clinical and Laboratory Standards Institute criteria. And the data were collected directly using questionnaire. The serum obtained and analyzed using colorimetric method in fully Automated Biochemistry Analyzer. The psoriasis area and severity index (PASI) scores of psoriatic patients were recorded as determined by a Dermatologist.

Ethical Consideration:

This study was approved by the ethical committee of faculty of medical laboratory science of Alneelain University.

Statistical analysis:

Data obtained were expressed as mean \pm SD. Statistical analysis performed using SPSS, version 21. Difference in mean values between groups compared by independent t-test. The person correlate test using the correlate between study parameters and variables significant differences considered as (P value ≤ 0.05).

Results

Fifty patients known diagnosed with psoriasis and another 50 subjects as control group were enrolled in this study. The age was match ranged between (12 and 60 years) and their mean 32.4 ± 12.1 . In the patients the males were 33 (66%), and females were 17 (34%), control group the males were 31 (62%), and females were in 19 (38%) (Figure 1). Figure 2 shows the distribution of duration of disease among case study. The duration of disease less than one year was 35 (70%) and more than one year was 15 (30%). Figure 3 shows the severity of disease among patients. The mild 18 (36%), moderate 23 (46%) and severe 9 (18%). Table (1) represents the means levels for serum copper, zinc and copper/ zinc ratio in psoriatic patients respectively (21.73 ± 5.32 , 85.66 ± 16.46 , 0.27 ± 0.13) and also the means levels for serum copper, zinc and copper/ zinc ratio in control group respectively (18.01 ± 3.53 , 91.86 ± 13.19 , 0.20 ± 0.05). A significantly increased of serum copper in psoriatic patients compared to healthy group ($p = 0.000$) and a significantly decreased of serum zinc in psoriatic patients compared to healthy group ($p = 0.040$). Copper/ zinc ratio was significantly increased in patients than controls ($p = 0.000$). In the table (2), the means levels for serum copper, zinc and copper/ zinc ratio in male patients respectively were (22.02 ± 5.84 , 84.39 ± 17.23 , 0.28 ± 0.13) while the means levels for serum copper, zinc and copper/ zinc ratio in female patients respectively were (21.16 ± 4.22 , 88.12 ± 15.05 , 0.25 ± 0.09). There was no significant difference between the means levels for serum parameters according to gender. In the table (3), the means levels for serum copper, zinc and copper/ zinc ratio in patients during (6 Month-1 year) respectively were (20.51 ± 4.56 , 88.94 ± 14.99 , 0.24 ± 0.09), also the means levels for serum copper, zinc and copper/ zinc ratio in control group (during >1 year) respectively were

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(24.57 ± 6.00 , 78.00 ± 17.67 , 0.34 ± 0.15). Serum copper was significantly increased in psoriatic patients infected >1 year compared to patients infected 6 month-1 year ($p = 0.012$). The serum zinc was significantly decreased in psoriatic patients infected >1 year compared to patients infected 6 Month-1 year ($p = 0.030$). Also the copper/ zinc ratio significantly increased in psoriatic patients infected >1 year compared to patients infected 6 month-1 year ($p = 0.027$). In figure (4), the serum copper was a significantly difference ($p = 0.001$) between severity of psoriatic disease compared to mild and moderate. In figure (5), the serum zinc there was a significantly difference ($p = 0.001$) between mild and moderate and also a significantly difference ($p = 0.022$) between severity of psoriatic disease compared to mild and moderate. In the figure (6), the copper/ zinc was a significantly difference ($p = 0.000$) between severity of psoriatic disease compared to mild and moderate. In figure (7, 8), their no correlation between age and the serum copper ($r = -0.163$, $p = 0.259$) and zinc ($r = -0.084$, $p = 0.653$) respectively.

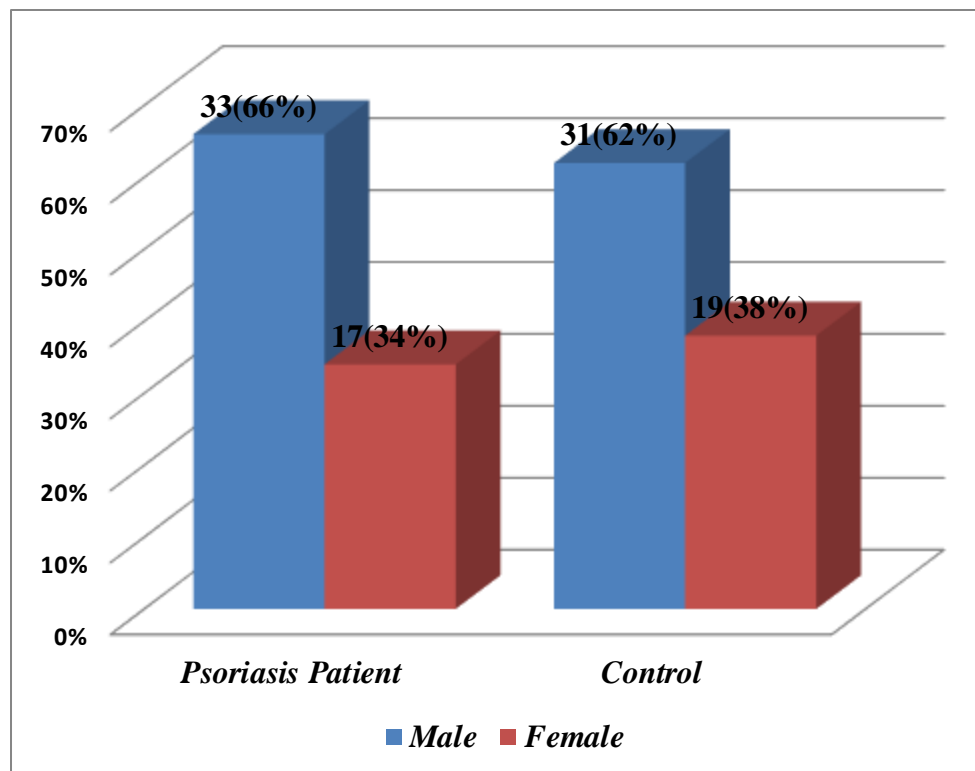


Figure (1): The distribution of study population according to gender

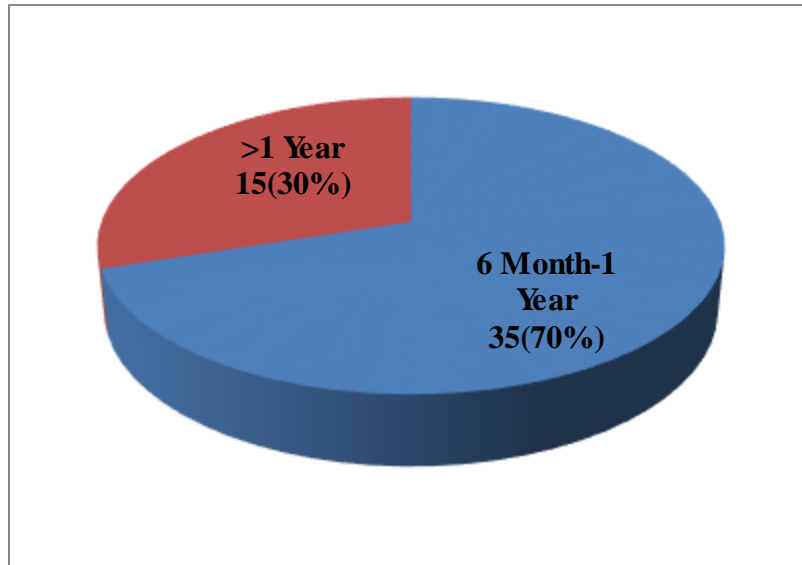


Figure (2): The distribution of duration of disease among case study.

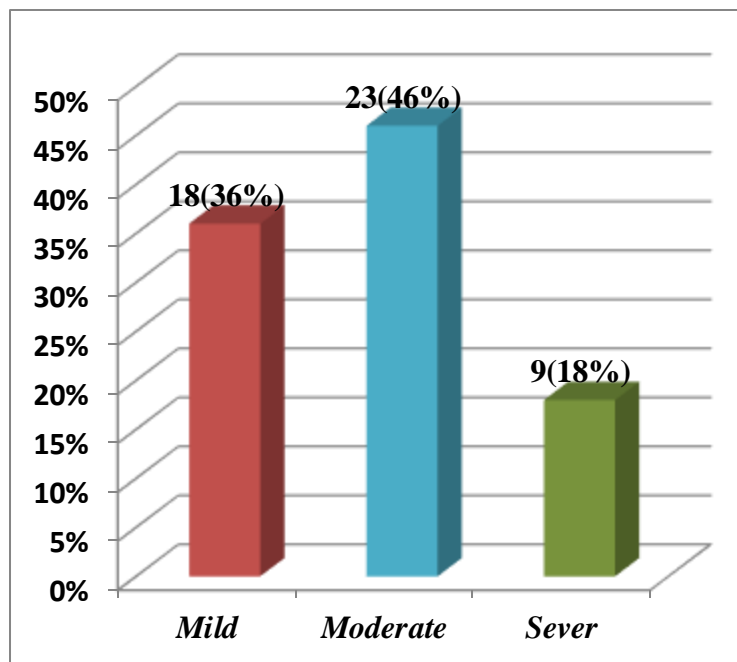


Figure (3): The severity of disease among patients.

Table (1): Study parameters among study population

| Parameters | Case (mean±SD) N=50 | Control (mean±SD) N=50 | P-value |
|--------------------|--------------------------------|-------------------------------|----------------|
| Copper (µmol/l) | 21.73±5.32*** | 18.01±3.53*** | 0.000 |
| Zinc (µg/dl) | 85.66±16.46* | 91.86±13.19* | 0.040 |
| Copper/ Zinc ratio | 0.27±0.13*** | 0.20±0.05*** | 0.000 |

Table (2): Study parameters among Psoriatic patients according to gender

| Parameters | Male (mean±SD) | Female (mean±SD) | P-value |
|-------------------|-----------------------|-------------------------|----------------|
| Copper (µmol/l) | 22.02±5.84 | 21.16±4.22 | 0.552 |
| Zinc (µg/dl) | 84.39±17.23 | 88.12±15.05 | 0.454 |
| Zinc/Copper ratio | 0.28±0.13 | 0.25±0.09 | 0.305 |

Table (3): Study parameters among Psoriatic patients according to duration of infections

| Parameters | 6 Month-1 Year (mean±SD) | >1 Year (mean±SD) | P-value |
|-------------------|-------------------------------------|-----------------------------|----------------|
| Copper (µmol/l) | 20.51±4.56** | 24.57±6.00** | 0.012 |
| Zinc (µg/dl) | 88.94±14.99* | 78.00±17.67* | 0.030 |
| Zinc/Copper ratio | 0.24±0.09* | 0.34±0.15* | 0.027 |

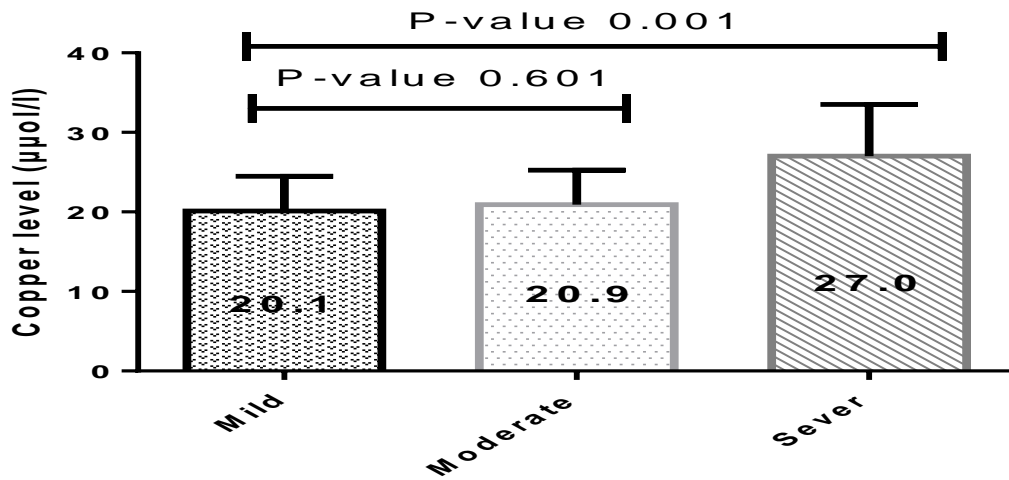


Figure (4): The serum copper among severity of disease

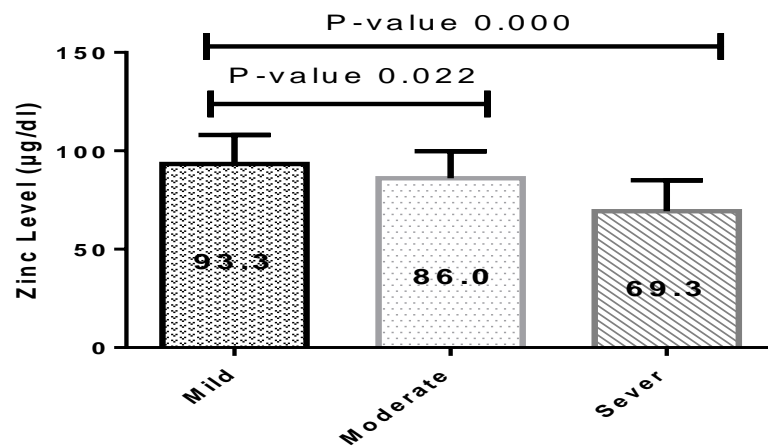


Figure (5): The serum zinc among severity of disease

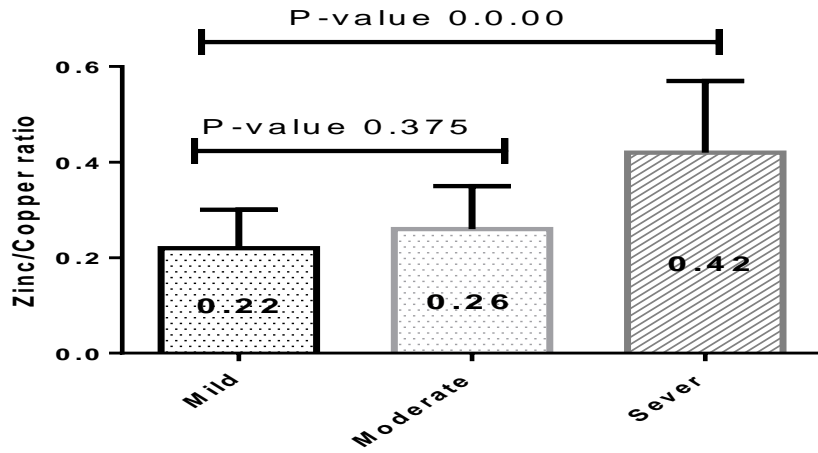


Figure (6): The serum Zinc/Copper among severity of disease

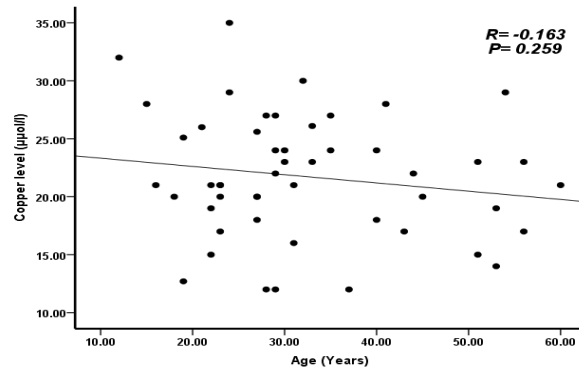


Figure (7): The correlation between age and serum copper

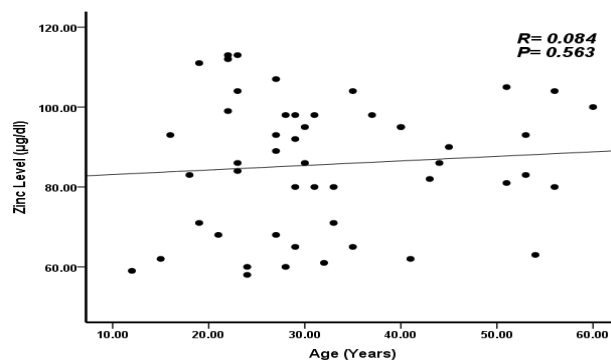


Figure (8): The correlation between age and serum zinc

Discussion

The current study revealed a significantly increased of serum copper in psoriatic patients compared to healthy group and a significantly decreased of serum zinc in psoriatic patients compared to healthy group, furthermore, copper/ zinc ratio was significantly increased in patients than controls. Similar result recorded by Lei *et al.* who stated that an increased serum copper and decreased serum zinc levels were generally observed in patients with psoriasis⁽¹³⁾. In contrast Wacewicz *et al.*⁽¹⁴⁾ stated that Cu level of psoriatic patients was higher as compared to controls, while Zn level did not differ and there was higher Cu/Zn ratio and same result reported Ala *et al.*⁽¹⁵⁾. There were no differences in serum Zn levels between male and female patients with psoriasis⁽¹⁴⁾ and consistently the current study revealed same finding. This study demonstrated that serum copper level and copper/ zinc ratio were positively correlated with psoriasis duration while serum zinc level was negatively correlated with psoriasis duration, but opposite conclusions were reached by Wacewicz *et al.*⁽¹⁴⁾ and Elhaddad *et al.*⁽¹⁶⁾. The findings of present study indicate that mean serum copper and mean serum copper/zinc ratio were positively correlated with the severity of the disease while mean serum zinc was negatively correlated with the severity of psoriasis. Similarly, Gajjar *et al.*⁽¹⁷⁾ and Khan *et al.*⁽¹⁸⁾ proved similar finding.

Limitations of the Study

Being a cross-sectional and enrolling a small number of patients are drawbacks that hinder generalizing our findings. The inherent low sensitivity of colorimetric assay used to measure Zn and Copper is known vs.e.g., atomic absorption spectrometry that is out of our reach.

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Conflict of Interests

The authors declared no conflict of interests.

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