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Skin severity and serum zinc level in Libyan patients with cutaneous disorders :Case study

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Abstract

zinc is one of the important trace elements related to health and disease .we designed a study of 145 patients to determine the extent of serum zinc in psoriasis ,seborrheic dermatitis , acne vulgaris , alopecia areata , and vitiligo , same numbers were served as healthy controls. It was significantly lower in acne cases 74.5 ± 14.7 ugm/lOOml., and alopecia 77 ± 12 ugm/lOOml and seborrheic dermatitis (0.82±0.27 ugm/lOOml) as compared to healthy controls and Serum Zn was significantly higher in psoriasis 142.2±52.2 ugm/lOOml and vitiligo (0.82±0.27 ugm/lOOml) as compare to control . There is a positive correlation (r=0.138) between serum zinc level and area of skin involvement in psoriasis , Seborrheic dermatitis were not statistically significant. In acne vulgaris the very severe cases had the lowest zinc levels measured in mg/L (0.67 ± 0.13 mg/L compared to mild, moderate and severe cases (0.73± 0.14, 0.75 ± .16 , alopecia multilocularis (AM) had significantly lower serum Zn (P=.000), as compare to alopecia Unilocularis (AU) patients ,serum Zn was lower in patients with active disease as compare to patients with stable vitiligo, (p=.118)These differences were not statistically significant .

Key Words: Zinc , dermatitis , enzymes , deficiency , psoriasis .

Aim of the study

Due to the lack of information related to serum zinc level in Libyan skin disorder .The aim of our study was to assess the influence of serum zinc level in patients with psoriasis , seborrhoeic dermatitis , acne vulgaris and skin lesion severity .

1.Introduction

Approximately 20 % of the total Zn in the body is located in the skin (1), Zn concentrations are most abundant in the stratum spinosum, more so than in the other three KC layers [2]. In dermatology, zinc one of the important trace elements related to health and disease , some disorders are caused by nutritional factors through different mechanisms, It is also well documented that nutritional status can affect immune system function, autoimmunity and resistance to bacterial infection (3,4) It is a micronutrient with many enzymatic functions, synthesis of DNA, RNA, and proteins, well as the metabolism of proteins, carbohydrates, and lipids, growth, and physical development are also associated with the actions of zinc (5,6). Some zinc investigators have also reported low serum zinc levels in some skin disorders like acne vulgaris, psoriasis, lichen planus, leprosy, ichthyosis, urticaria, etc., including inflammatory diseases as atopic dermatitis [7, 8], oral lichen planus [9], autoimmune bullous diseases [10] [11]) [12,13]). while others have refuted these findings [14, 15]]. The World Health Organization (WHO), the International Atomic Energy Association (IAEA), and the United Nations Children's Fund (UNICEF) reviewed and recommended available indicators of population zinc status for international use. These indicators can be used together in population and subgroup assessments to estimate the zinc status (16).

2.Material and method

2.1 Cases and Controls

The study included 145 patients with 40 psoriasis, 40 sebohorriec dermatitis , 65 acne vulgaris , 42 Alopecia areata, 50 Vitiligo Vulgaris and. selected from Dermatology outpatient clinic - Elfwayhat – OPD and Al-jumhuryia skin department in Benghazi at period of time extending from April 2017 to April 2018 and subjected to through clinical examination and laboratory investigation . 145 healthy control subjects were selected from same medical outpatient clinic and medical staff a detailed history was recorded in all cases. Each group was matched by age and gender .

2.2 Clinical diagnostic criteria patient and control examination.

Each case and control underwent a thorough general, physical, systemic , and dermatological examination and relevant laboratory investigations.

2.3 Exclusion criteria

Persons with history of diabetes, hypertension, psychiatric disorders, cardiac problems and other chronic skin disorders were excluded from the present study , All patients had not received any treatment during the last 6 months before the study.

2.4 Ethical Consideration

Approval from the director of the hospital was taken before starting the study as there is no ethical committee in the hospital. Verbal consent was taken from cases and control.

2.5 Instrumentation and elemental analysis

A five cc of blood are taken in plan tube and sent to the laboratory to separate the cells from the serum ,which it should be carried out promptly by centrifugation at 4c where necessary .Zinc analysis was carried out using p "Philips PU9200XES series Atomic Absorption Spectrophotometer " .

2.6 Statistical analysis:

All statistical analyses were performed using SPSS software , for Windows (Version 23). Results are presented as mean and standard deviations for continuous variables and as a number (%) for categorical variables. Comparisons between the patients and the control group were done by t test and f test P values <0.05 .

3 Result

3.1 demographic data

A total of 238 patients with 41psoriasis vulgaris,40 Seborrheic dermatitis,65 Acne vulgaris,42 Alopecia areata,50 Vitiligo vulgaris were enrolled in this study and compared with same number with age and sex matched healthy control subjects. Table 1. Show the demographic data of patients and control subjects

Demographic data	patients				Control subject					
	number	Age	male	Female	number	Age	male	female	P value	
									Age	Sex
Psoriasis	41	32.5±9 yrs.	20 (48.8%)	21 (51.2%)	50	31.8±9 yrs.	23 (46%)	27 (54%)	.699	479
Seborrheic dermatitis	40.	30 ±17yrs.	11(27,5 %)	29 (72,5%)	40	30 ±17yrs	13(46%)	27(54%)		

Acne vulgaris	65	12 ± 6.3 years	11 (16.9%)	54 (83.1%)	65	22 years ± 7.4	11 (16.9%)	54 (83.1%)		
Alopecia areata	42	29.3 ±7 yrs	24 (57%)	18 (43%)	50	32 ±10 yrs	3(46%)	27(54%)	0.117	0.196
Vitiligo vulgaris	50	34 ±6 yrs	24(48%)	26(5 2 %)	50	32.2±9 yrs	23(46%)	26(52%)	.235	.902

Table 1. Demographic data of skin diseases patients and control subjects under study

3.1 Serum Znc level

Out of 41cases of **psoriasis,** Serum zinc level 40-71µg/dL psoriasis control serum zinc level 71-112 µg/dl . The reduced levels of serum zinc observed in psoriasis group are highly significant (p=< 0.01) compared to control ,the mean average serum zinc level in **40**patients of **seborrhiec dermatitis** was (0.82±0.27) while in controls was (0.89±0.19) these observed in the patient group were apparently lower although statistically there is no significant difference (p>0.05) from control group Table 1. **42 alopecia patients** Show Serum levels of Zn was significantly lower in patients as compare to control subjects (P=.000), **in acne vulgaris 65 patients** ,the mean ±SD serum zinc level of controls was higher (0.89± 0.19mg/L) compared to serum zinc levels in diseased cases with a mean value of 0.74±0.14 mg/L. This difference was highly significant, P < 0.01 .Serum Zn was significantly higher in50 **vitiligo patients**, female patients had lower serum levels of Zn, than male patients but this difference was statistically insignificant,as table 2

Cutaneous disorder	**Mean Serum zinc Mean ± SD** Patients (238)	**Mean Serum zinc Mean ± SD** Control (238)	P value
Psoriasis	142.2±52.2	90.2±18.9	000*
Acne vulgaris	74.5 ± 14.7	94 ± 13.4	0.0001
Seborrheic dermatitis	0.82±0.27	0.89±0.19	p>0.05
Vitiligo	111±40	90.2±17	.001*
Alopecia areata	77 ± 12	90.2 ± 18.9	.000*

. *Table 1.Serum zinc levels*(µg/dl) *in cutaneous disorders*

3.2 skin lesion activity

In psoriasis

There is a positive correlation (r=0.138) between serum zinc level and area of skin involvement . However, this correlation is not statistically significant (p > 0.05) .

Seborrheic dermatitis cases and control:

Appositive correlation is observed between the area of and serum zinc level skin involvement (.398).

In acne vulgaris

. Very severe cases had the lowest zinc levels measured in mg/L (0.67 ± 0.13 mg/L compared to mild, moderate and severe cases (0.73± 0.14, 0.75 ± .16 &0.82 ± .10 mg/L respectively).These differences were not statistically significant. .

Alopecia areata cases and control

In the total of 42 patients with AA, there were 14 (33.3%) patients with alopecia Unilocularis (AU) , 28 (66.7%) patients with alopecia multilocularis (AM.) According to clinical type patients with AM had significantly lower serum Zn (P=.000), as compare to AU patients

Vitiligo Vulgaris

Vitiligo patients were divided into two groups as active and stable according to the progression of the disease Table 2. represent the serum Zn levels under study was significantly higher in vitiligo patients, All serum Zn was lower in patients with active disease as compare to patients with stable vitiligo, but this difference was statistically insignificant Table3

Skin involvement	Mild Mild <25	Moderate25-49	sever50-74	very sever ≥75	p
Psoriasis	(**PASI score**) 171±49	**(pASI score**) 124±46		~	.004*
Seborrheic dermatitis	0.79±.25	0.84 ±.29		~	398
Acne vulgaris	0.73± 0.14	0.75 ± 0.16	0.82 ± .100	.67 ± 0.13	0.90
Alopecia	(Unifocal Alopecia) 81 ± 11	(Multifocal alopecia) 68.4 ± 10	~	~	.000*

Vitiligo	Localize 117 ±37	Generalize 100±46	~	~	.118

Discussion

Normal serum zinc level ranges from 70 to 180 ~gm/lOOml with the mean value of 120 f 22 ~gm/lOOml . it is a cofactor for over 1000 enzymatic reactions [17, 18] and is necessary for over 2000 transcription factors [18]. It is required for the proliferation of KCs and the suppression of inflammation in KCs. [19].

At present, acquired Zn deficiency (ZnD) still affects 17% of the world's population who are in the condition of general malnutrition due to starvation, severe illness, alcohol addiction. Additionally, infants, the elderly, and pregnant women are also prone to fall into acquired ZnD [20–21].. ZD characteristically causes the cutaneous disorder of acrodermatitis enteropathica manifesting [22]. Some zinc investigators have also reported low serum zinc levels in cutaneous disorders like acne vulgaris, psoriasis, lichen planus, leprosy, ichthyosis, urticaria, chronic ve- nous leg ulcers etc., while others have not found the same [22].

In the present investigation we observed that a highly significant reduction in serum zinc level was found in psoriasis patients as compared to healthy controls. This is in agreement with the findings of Greaves and Boyde [23] and Morgan et al [24] . Several investigators have reported that the serum Zn level is exceedingly low in psoriasis patients [25, 26]. The most likely explanation for the decreased serum Zn level in psoriasis patients is Zn depletion secondary to loss of Zn through exfoliation [26]. Voorhees et al. [27] noted that psoriatic lesions retain a high content of Zn compared with uninvolved skin, suggesting a Zn imbalance by the acceleration of cell division, and increased protein synthesis in the psoriatic lesion may subsequently cause low Zn levels in the serum. Hinks et al. [28] reported no change in the Zn levels in psoriasis patients. McMillan and Row (29)reported decreasing levels of zinc in serum with increase in body surface area involvement. However, the same was observed in the present study.

Some investigators had reported an association between low serum zinc levels and acne vulgaris, while others have not found the same [30]. Amer and his colleagues found the same (31) Ozugus found a negative correlation between serum zinc level and severity of acne vulgaris [32].and there was no a significant correlation between our patients serum zinc levels with acne severity . Cochran et al There was a significant correlation between serum zinc levels with severity and type of acne lesions .These findings were not noticed in our study [33, 34]. A decreased serum zinc level could also lead to increased androgenic production, which influences the activity of sebaceous glands. The precise role of zinc in the development of acne is not known.

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The level observed in the patient with seboherric dermatitis(SD) are a apparently lower although statistically there is no significant difference from control group . There is study revealed that zinc levels in healthy control were below the lower references in patients with different clinical types of eczema (35) anther study that was noticed the mean serum zinc level was statistically lower among patients with different types of eczema compared to control group (36). Moreover, Mrinal et al. [37] stated that endemic zinc deficiency is found in rural Iran, Egypt and Turkey due to eating whole grain bread with high fiber and phytate content that renders zinc nearly un absorbable , Serum zinc levels were statistically lower in case group than control pointing out the possible role of zinc in the pathogenesis of eczema. [38] There was a positive correlation between low serum zinc levels with severity skin lesions in present study

and the level of serum zinc in SD the patient is ,appositive correlation with the area of skin involvement.

Zn and Cu are an essential trace elements required for functional activities in hair follicle and help in hair follicle recovery [39]. Many studies speculated that a copper/zinc imbalance might play a role in AA pathogenesis through an imbalance in oxidant/antioxidant activity . Zn and Cu required for the function of many enzymes like; alkaline phosphatase which has elevated activity in hair follicle, and copper/zinc superoxide dismutase which is potent antioxidant [40]. Moreover, deficiency of Zn impairs DNA and RNA production which is required for the normal division of hair follicle cells and developmental stage of hair growth [41]

In the present study, mean serum Zn was significantly lower in patients with AA than that of controls, Our results are in agreement with previous studies which reported lower serum levels of Zn in their patients with AA [42, 40-]

In the present study patients with AM had significantly lower serum Zn as compare to patients with AU, this was in agreement with study of Abdel Fattah et al., who reported an inverse correlation between serum zinc levels and severity of AA [40]. No correlations were found between duration of

the disease and serum levels of Zn , inconsistent with previous study which reported an inverse correlation between serum zinc levels and duration of AA [40].

Zinc was important cofactor and modulator of many critical biological functions in skin disorders including dermatitis enteropathica, bullous pemphigoid, decubitus ulcer, alopecia areata, psoriasis, vitiligo and skin cancer (43). Moreover, they are involved in inflammatory reactions and important for the normal functioning of the immune system (39). They are integral part of metalloenzymes necessary in the final stage of eumelanin formulation in melanogenesis (39).Many studies have been made to reveal the effect of trace elements on vitiligo, but these studies provide conflicting results (44).

Serum Zn in our patients was higher than the control subjects. These finding are in agreement with previous study (40).Increased Zn serum level was also observed by studies of Ali et al (45)and Bashaetal(39).While many previous studies reported a significantly lower serum Zn among patients with generalized vitiligo (43,46,47). However, Arora et al. in their study reported lower serum Zn in patients with vitiligo but this difference statistically was insignificant (48). There was no significant correlation between the serum level of Zn with activity of the disease in the present study in agreement with previous studies (43,39).

Conclusion :

It is concluded that low serum zinc level were found to be significantly lowered in patients of psoriasis, acne vulgaris , as compared to healthy controls, and otherwise low serum zinc level not significant in seboherreic dermatitis . Skin involvement was positively correlated with low serum zinc level in psoriasis and acne vulgaris and seboheeric dermatitis also .low serum levels of zinc seem to be an important risk factors for AA especially with more extensive disease .Routine serum testing of these elements and therapeutic supplementation can be recommended for AA patients.

Recommendation:

ZnD is a current problem in both developing and developed countries. we have to pay attention to state endemic zinc deficiency what may be find in Libyans where they are seeds diet lovers like rice and macaronia. Accumulation of evidence is required to determine The role of micronutrients in the pathogenesis and course of skin disorders warrants further study .

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