ORIGINAL ARTICLE

Clinico-epidemiological study of Vitiligo in Egyptian Children

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Abstract

Background: ***Depigmented patches of skin are the hallmark of vitiligo. It impacts all racial groups equally and affects between 0.1 and 2% of the global population, including both adults and children of both sexes. Positive family history is present in about 30–40% of patients.***

Aim and objectives: ***To evaluate anthropometric measurements, serum levels of zinc and copper in Egyptian children with vitiligo and their relation to the severity of the disease.***

Subjects and methods: ***From May 2024 to March 2025, researchers at the Dermatology Department, Faculty of Medicine, Al-Azhar University recruited 100 vitiligo patients and 70 healthy individuals who were age and sex matched.***

Results: ***As regard comparison of Zn level between studied groups, the median Zn was 98.5 with IQR of 78.5-141.7 while in Control group, median Zn was 107.5 with IQR of 88-143 but difference was insignificant. As regard comparison of Cu level between studied groups. In patient's group, median Cu was 104.5 with IQR of 74-139.7 while in Control group, median Cu was 115.5 with IQR of 82-139, but difference was insignificant.***

Conclusion: ***Despite low Zn and Cu serum levels in case group in comparison with control group, it was insignificant in children with vitiligo, there is no significant difference regarding anthropometric measures in the studied group.***

Keywords: Clinico-epidemiology; Vitiligo; Egyptian children

1. Introduction

Particularly for persons of color and/or those residing in nations with diverse cultures, vitiligo may have a devastating impact on one's sense of self-worth, marital satisfaction, and career opportunities.[1]

When melanocytes, the cells responsible for producing melanin pigment in the skin, hair, mucous membranes, and retina, die out, a condition known as skin depigmentation develops. Symptoms include the appearance of many white patches on various areas of the skin.[2]

Segmental vitiligo (SV) and non-segmental vitiligo (NSV) are the two main types of vitiligo. White patches that are symmetrical and present on both sides are the hallmark of non-segmental vitiligo, the most prevalent type of this unpredictable condition.[3]

Zinc and copper are essential minerals that participate in numerous biochemical reactions within the body. Zinc is involved in gene expression, enzymatic activity, immune function, and neurodevelopment. It is required for proper growth and development, DNA synthesis, protein synthesis, and wound healing. In addition to its antioxidant properties, it shields cells from free radical damage.[4]

They have a crucial role as cofactors for the antioxidant enzyme superoxide dismutase, which shields the skin from ROS.5 The imbalance of the Cu/Zn ratio has been linked to numerous human disorders. These trace metals are important for human health.[6]

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Because of their roles as metalloenzymes, copper and zinc facilitate the formation of eumelanin during melanogenesis by catalyzing the reaction of 5,6-dihydroxy indole-2-carboxylic acid (DHICA). Zinc, copper, and other trace elements' antioxidant properties also mitigate free radical damage.[7]

The purpose of this research was to examine the correlation between anthropometric parameters, zinc and copper serum levels, and vitiligo severity in Egyptian children.

2. Patients and methods

From May 2024 to March 2025, researchers at the Dermatology Department, Faculty of Medicine, Al-Azhar University, examined 100 vitiligo patients and 70 healthy individuals who were age and sex matched.

Inclusion criteria:

Children less than 18 years old with vitiligo.

Exclusion criteria:

Patients above 18 years old.

Ethical considerations:

This study was conducted after approval of the Research Ethics Committee of Al-Azhar University Hospitals (Approval NO. 114), and informed consent was obtained from the parents or caregivers of participants.

Study tools:

All patients were subjected to the following:

Detailed examination of developmental history, autoimmune disease history, and the existence of vitiligo in the patient's family. The clinical examination will include many areas such as the general health of the patient, their heart, lungs, abdomen, and skin.

Assessment of Vitiligo Body Surface Area (BSA):

We used hand units to calculate the percentage of vitiligo involvement. The palm and the volar surfaces of each finger make up one hand unit, which accounts for approximately one percent of the body's total surface area. The anthropometric evaluation included taking the following measurements: height, weight, MUAC, and head circumference. Atomic absorption spectroscopy of copper and zinc in the blood (BA-88A).

Serum sampling:

A total of four milliliters of whole venous blood was collected from each participant in the trial and placed in a plain vacutainer tube with clot activator and gel. After twenty minutes of full blood clotting, the serum was separated by centrifugation at 4000 RPM for ten minutes. Separated serum was kept at -20C until analysis.

Assessment of zinc serum level:

The zincon reagent (2-carboxy-2′-hydroxy-5-sulfoformazyl-benzene) was used to chelate the zinc in the sample at a pH that was slightly above acidic. Spectrophotometry is used to measure the complex formation that results at a wavelength of 610 nm.

Procedure:

Test tubes were prepared free of zinc contamination. The reagents were added as outlined below: Mixed thoroughly and incubated for 10minutes at 25°C. The absorbance of the standard (A_standard) and sample (A_sample) against the reagent blank at 610 nm was measured within 15minutes.

Calculation:

The concentration of zinc in the sample was calculated using the following formula:

To find the zinc concentration in the sample, divide the sample volume by the standard volume, and then multiply the result by the standard concentration.

Where: A_sample represented the sample's absorbance measurement.

The absorbance measurement of the reference was denoted as A_standard.

Assessment of copper serum level:

Copper was released from proteins by hydrochloric acid, which denatured the protein. The protein was then precipitated using trichloroacetic acid. Diethyldithiocarbamate reacted with copper to form a golden yellow complex, which was extracted using n-butanol. The intensity of the color, measured at 440nm, was proportionate to the sample's copper concentration.

Procedure:

Each of the three tubes—the sample, the standard, and the blank—was prepared separately. Reagents such as these were included: After a good mixing, the ingredients were set aside for 10 minutes. Subsequently, the following chemicals were introduced: Prior to centrifugation at 4000 rpm for 10 minutes, the mixture was stirred once more and left to stand for 10 minutes. The pellet was discarded, and the supernatant was decanted. The following reagents were added:

The solution was mixed well, and the following reagent was added: The mixture was shaken for 5minutes. The organic layer containing the copper complex was removed and dried by shaking it with a small amount of powdered anhydrous sodium sulfate (R8). Dry cuvettes were used to measure the absorbance of the sample (A_sample) and the standard (A_standard) against the blank at 440 nm.

Calculation:

The concentration of copper was calculated using the formula:

Copper concentration (µmol/L or µg/dL)= (A sample/A_standard)×Standard Concentration

Where:

A sample was the absorbance of the sample.

A standard was the absorbance of the standard.

Statistical analysis:

Data were analyzed using SPSS 24. Qualitative data were frequency and percentage. Quantitative data were presented as mean ±SD for normally distributed data and median (IQR) for non-normal data. In a discrete set of numbers, the mean is the total of the values divided by the number of values. Standard deviation (SD): measures value dispersion. A low SD implies that the values are close to the established mean, while a high SD indicates a broader range. Median: Order all data points and choose the middle one (or the mean of two middle numbers). IQR measures statistical dispersion, or data spread. Difference between 75th and 25th data percentiles.

Mann-Whitney U test (MW): For improperly distributed data, two groups were compared. Kruskal-Wallis test (KW): for erratically distributed data comparing more than two groups. Non-parametric data were compared using the chi-square test.

For probability (P-value), P-value < 0.05 was considered significant, P-value < 0.001 was extremely significant, and P-value > 0.05 was insignificant.

3. Results

Table 1. Age and sex comparisons between the groups under study.

		PATIENTS (N=100)		CONTROL (N=70)		STAT. TEST	P-VALUE
AGE (YEARS)	Median (IQR)	12(9-14)		11(8-13)		MW=2881	0.048 S
	Mean±SD	11.4±3.4		10.5±3.3			
SEX	Male	38	38%	28	40%		
	Female	62	62%	42	60%	X2=0.06	0.792 NS

MW: Mann Whitney examination. A p-value of less than 0.05 is deemed significant.

X2: Chi-squared analysis. A NS:p-value of greater than 0.05 is deemed non-significant.

The age difference between the patient's group (median=12, IQR=9–14) and the control group (median=11, IQR=8–13) was statistically significant (p-value=0.048). There was no sex-related statistically significant difference (p-value=0.792) among the patient and control groups under study. There were 62 girls (62%) and 38 males (38%) in the patient's group. There were 42 females (60%) and 28 guys (40%) in the control group, (table 1).

Table 2. Zn and Cu comparison between the groups under study.

		PATIENTS (N=100)	CONTROL (N=70)	MW	P-VALUE
ZN (UG/DL)	Median (IQR)	98.5(78.5-141.7)	107.5 (88-143)		0.431
	Mean±SD	111.4±43.3	112.8±34.2	3251	NS
CU (UG/DL)	Median (IQR)	104.5(74-139.7)	115.5(82-139)		0.276
	Mean±SD	105.9±41.9	112.4±34.7	3156	NS

MW: Mann Whitney examination.A NS:p-value of greater than 0.05 is deemed non-significant.

There was no statistically significant difference in zinc between the patient and control groups under study (p-value = 0.281). The median zinc level was 98.5 with an IQR of 78.5-141.7 in the patient's group and 107.5 with an IQR of 88-143 in the control group.

There was no statistically significant difference in Cu between the patient and control groups under study (p-value = 0.276). The control group's median Cu was 115.5 with an IQR of 82-139, while the patient group's median Cu was 104.5 with an IQR of 74-139.7, (table 2; figures 1&2).

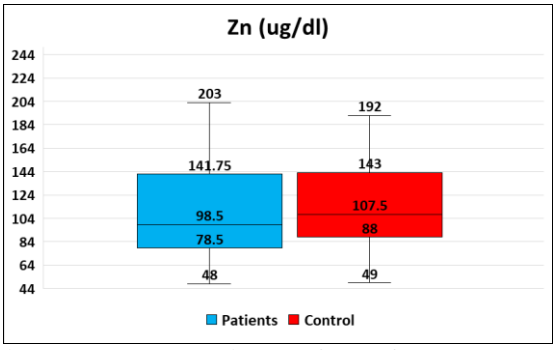

Figure 1. Comparison of Zn between studied groups.

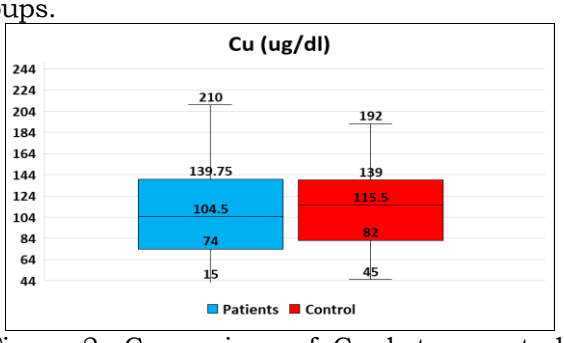

Figure 2. Comparison of Cu between studied groups.

Table 3. Body measure comparisons between the groups under study.

		PATIENTS (N=100)	CONTROL (N=70)	MW	P-VALUE
HEIGHT (CM)	Median (IQR)	147(133.2-153)	144(130-152.2)		0.281
	Mean±SD	142.5±19.5	140.6±17.7	3159	NS
WEIGHT (KG)	Median (IQR)	40(30.2-53.7)	39.5(27-47)		0.102
	Mean±SD	43±17.1	38.4±14	2984	NS
MAC (CM)	Median (IQR)	21(18.5-24)	20.5(21.7-23)		0.470
	Mean±SD	21.2±4	20.6±2.9	3272	NS
HC (CM)	Median (IQR)	52(50.1-53)	52(50-52.5)		0.346
	Mean±SD	51.5±2.3	51.3±1.7	3204	NS

MW: Mann Whitney examination.A NS:p-value of greater than 0.05 is deemed non-significant.

There was no statistically significant difference in height between the patient and control groups under study (p-value = 0.281). The control group's median height was 144 with an IQR of 130-152.2, while the patient group's was 147 with an IQR of 133.2-153.

There was no statistically significant difference in weight between the patient and control groups under study (p-value = 0.281). The control group's median weight was 39.5 with an IQR of 27–47, whereas the patient group's median weight was 40 with an IQR of 30.2–53.7.

Regarding mid-arm circumference (MAC), there was no statistically significant difference (p-value=0.470) between the patient and control groups. The control group's median MAC was 20.5 with an IQR of 21.7-23, while the patient group's median MAC was 21 with an IQR of 18.5-24.

There was no statistically significant difference in HC between the patient and control groups under study (p-value = 0.246). The control group's median HC was 52 with an IQR of 50-52.5, whereas the patient group's median HC was 52 with an IQR of 50.1-53, (table 3; figures 3&4).

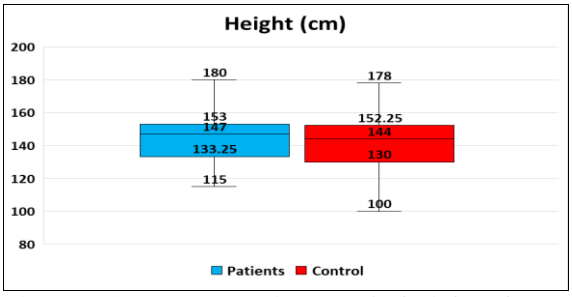

Figure (3): Comparison of height between studied groups.

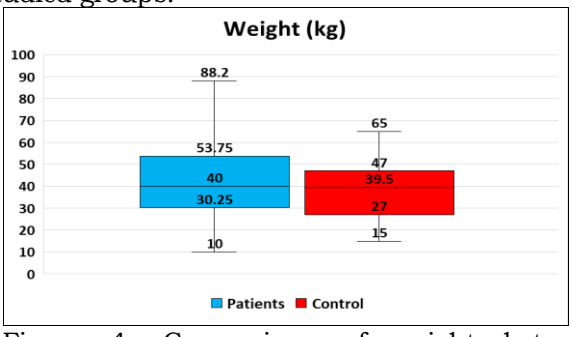

Figure 4. Comparison of weight between studied groups.

Table 4. Correlation study between Zn and Cu and other studied data in patient's group.

PATIENT'S GROUP	ZN		CU	
	r	p-value	r	p-value
BSA OF VITILIGO	-0.17	0.085	0.09	0.36
DURATION	0.03	0.796	-0.14	0.167

(r):Pearson correlation coefficient. *:p-value<0.05 is considered significant.

In Patient's group there were:

No statistically significant (p-value>0.05) correlation between Zn and BSA (body surface area)

of vitiligo. No statistically significant (p-value>0.05) correlation between Zn and duration of the disease. No statistically significant (p-value>0.05) correlation between Cu and BSA of vitiligo. No statistically significant (p-value>0.05) correlation between Cu and duration of the disease, (table 4; figures 5&6).

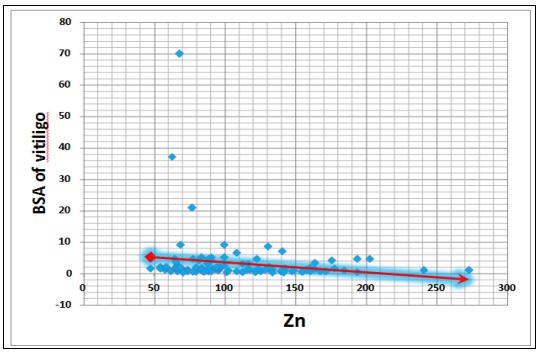

Figure 5. Negative correlation between Zn and BSA of vitiligo in patient's group.

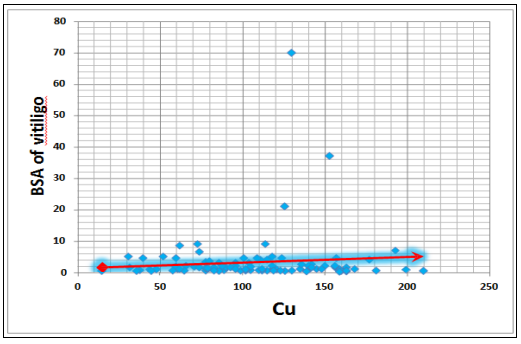

Figure 6. Positive correlation between Cu and BSA of vitiligo in patient's group.

Case presentation:

Case one

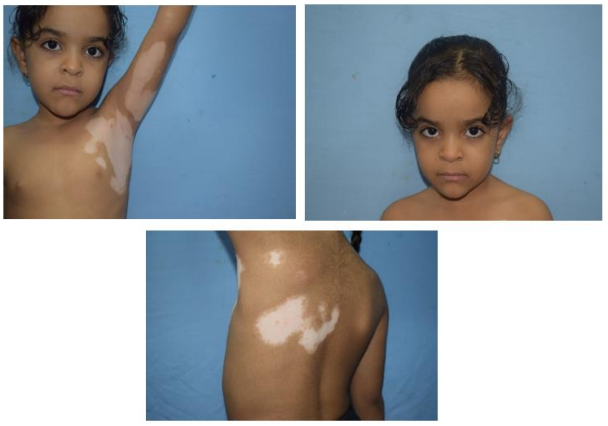

Figure 7. Female patient 4 years old with segmental vitiligo affecting around 2.5 percent BSA.

Case two

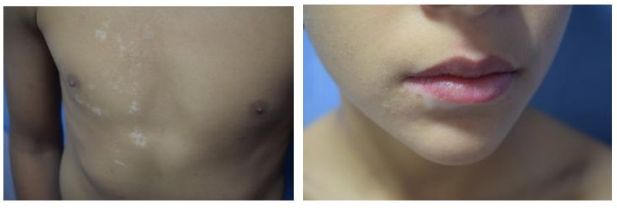

Figure 8. Male patient 14 years old with focal vitiligo less than 1% of BSA.

4. Discussion

Vitiligo is an acquired disease that causes milky white, non-scaly macules on the skin, hair, and mucous membranes due to a selective and progressive loss of melanocytes.[6]

The prevalence of vitiligo is 0.5%–2% in the general population worldwide; in Europe and the United States, it is around 1%.[7]

The current study showed a lower mean level of Zn in the patient's group than in controls, but it was statistically insignificant.

Arora et al.,[8] 15 cases of vitiligo were examined for serum zinc; 4 of these cases were focal, 8 were segmental, and three were widespread. In these instances, the mean serum zinc levels were 97.3±26.6μgm/100ml, with a range of 37–143μgm/100ml. Although it was less than that of the controls (24 healthy people), the difference was not statistically significant (P=0.10).

Interestingly, Yaghoobhi et al.,[9] discovered that of the 86 vitiligo patients, 73 had normal serum zinc levels (84.9%), 4 had elevated levels (4.7%), and 9 had lowered levels (10.5%). They did not, however, have a control group to compare the serum zinc levels.

Several studies revealed differences in outcomes based on how BSA influenced things, such as with Mirnezami et al.,[10] They examined 103 vitiligo patients; 68.9% of them were women and 31.1% were men. Of the patients, 63 (61.2%) had generalized vitiligo, 39 (379.9%) had localized vitiligo, and 1 (1%) had mucosal vitiligo. Additionally, widespread vitiligo ran in 29.1% of the patients' families. Type II diabetes was reported by 27.2% of the patients, and thyroid problems by 19.4% of the patients.

Serum zinc levels were found to be considerably lower in individuals with global vitiligo than in healthy controls (P=0.031), although there was no significant difference in those with focal vitiligo (P=0.681). In the focal vitiligo group, the mean blood zinc level was 92.1 mcg/dl; in the generalized vitiligo group, it was 81.3 mcg/dl; and in the control group, it was 91.8 mcg/dl.

Contrary to what we found, Shameer et al.,[11] who evaluated serum zinc in vitiligo of 60 patients, with vulgaris pattern presented in 85% of the cases, and positive 33% family history, with mean age 33 and mean duration of the disease of 2 years, observed significantly lower levels of Zn (P<0.0002).

On the contrary, one study reported increase serum Zn Haider et al.,[12] who studied 30 patients with vitiligo with 10male patients and 20 females with age ranged between 14-50 years and mean age of 32.27 in comparison to 30 healthy individuals as control noted that Zn levels were increased in the patients than controls, but the change wasn't statistically significant (P=0.250).

The discrepancy between our results and previously mentioned other's results, who indicated significant decrease of serum Zn with vitiligo, might be attributed to the difference between percentages of patients with generalized vitiligo with only 34% vulgaris pattern in our study.

The current study showed lower mean level of Cu in patient's group than controls but it was statistically insignificant.

In a Chinese meta-analysis of 16 studies, by Zeng et al.,[13] Six studies found no statistically significant change between the two groups, while ten studies assessing serum Cu showed a substantial decrease (P<0.0001). The meta-analysis found that Chinese vitiligo patients typically have lower serum Cu and Zn levels. It should be highlighted that the research that is part of this meta-analysis is from various parts of China, and several of the studies themselves discuss the variation in levels caused by geographic location and dietary practices. Furthermore, there was inter-study variation since the number of participants in the healthy group (1682) and the vitiligo group (891) differed greatly.

Narang et al.,[14] discovered that patients had considerably higher mean serum levels of Cu than controls (P<0.0001). The results of increased Cu levels in instances supported the research by Helmy et al.,[15] where they stood much taller in the control group than in active vitiligo sufferers.

The current study showed no statistically significant relation between vitiligo and some anthropometric measures (height, weight, HC, and MAC).

Dragoni et al.,[16] studied the correlation between vitiligo and BMI to find out if there is a link between the two conditions and obesity. They found that a high BMI (≥30) in vitiligo patients is associated with a sudden onset of the condition, inflammation, and pruritus (P=0.021). However, vitiligo was not significantly associated with a low body mass index (≤18.5) (P=0.602).

O'Hagan et al.,[17] Researchers who looked at the link between BMI and vitiligo distribution found that places with more friction, like the waistline and body folds, had a higher incidence of vitiligo in those with a higher BMI. With an increase in weight classification, the likelihood of vitiligo appearing on various body parts such as the chest, stomach, axillae, arms, elbows, wrists, hands, fingers, genitals, buttocks, ankles, feet, and toes increased significantly (P=0.012, P=0.012, P=0.004, P=0.004, and P=0.01, respectively). In the absence of any reaction to vitiligo, it appears on the back, hips, legs, knees, lips, and mouth.

Sharifzadeh et al.,[18] investigated the

associations between vitiligo and BMI and concluded that Adults with vitiligo had a 1.5-unit lower BMI compared to controls [mean (SD) 27.8 (6.1) vs. 29.3 (7.2) kg/m²; P=0.001].

Advantages of the study:

To the best of our knowledge, our study is the first to explore the relation between vitiligo on one hand, HC and MAC on the other hand which found no statistically significant difference between studied groups.

Limitations: The current study was limited by small sample size, increase number of patients with localized vitiligo and by lacking other studies to compare results with regarding some anthropometric measures.

4. Conclusion

Despite low Zn and Cu serum levels in case group in comparison with control group, it was insignificant in children with vitiligo, there is no significant difference regarding anthropometric measures in the studied group.

Disclosure

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Authorship

All authors have a substantial contribution to the article

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Conflicts of interest

There are no conflicts of interest.

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