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Research Article

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Studies on serum level of some trace elements in oculocutaneous albinism subjects in Owerri metropolis

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ABSTRACT

Studies on serum level of some trace elements in oculocutaneous albinism subject in Owerri metropolis was carried out using standard methods. Sixty (60) volunteer subjects made of 30 male and 30 female were used for the study. With the help of syringes, their sera were obtained from their blood samples and used for trace element analysis. Observed results revealed significant ($p<0.05$) decrease in levels of copper and zinc in male and female oculocutaneous albinism subjects against the control. The mean values for copper and zinc in both male and female also showed significant ($p<0.05$) reduction when compared to the control. The observed decreased in copper could influence tyrosinase and subsequently melanin production. There is need to investigate the relationship of the pigmentation disorder with other trace elements that were not considered in the present study. This study has revealed the serum level of some trace elements in oculocutaneous albinism subject in Owerri metropolis.

KEYWORDS: Pigmentation, Oculocutaneous albinism, Owerri metropolis, Serum, Trace metals

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INTRODUCTION

In recent years, a lot of emphasizes have been made on disorders inherent from pigmentation of the body. Kenneth [1] noted that melanin, hemoglobin (oxidized and reduced), and carotenoids are the substances saddled with the responsibility of maintaining skin colour. The same author however noted that melanin is the major color determinant and is also responsible for variations in skin color. Apart from giving the skin its colour, melanin also protects the skin against the ultraviolent rays amongst other functions [2-4]. Different disorders of pigmentation involving melanin have been reported by different authors.

Albinism, a pigmentation problem of the body which results in lack or decreased levels of melanin pigment is one of such disorders [5]. Oculocutaneous albinism is a form of albinism in which both the eye, hair as well as the skin have reduced or absence of melanin pigment [6,7]. It is sometimes taken as an error that occurred due to poor differentiation [8]. Genetically, it is regarded as a disorder arising heterogeneously, which is most often an inherited autosomal recessive [9,10]. Over ten different forms of the pigmentation problem exist. Dermatology complications and cancer amongst other complications are common in Oculocutaneous albinism. However, the prevalence of oculocutaneous albinism is relatively low, about 1 in 20,000 people worldwide [11].

The role of essential trace metals or elements in human cannot be over emphasized. Trace elements such as zinc (Zn), copper (Cu), Iron (Fe), amongst others are known to perfume crucial functions in humans and they account for about 0.02% of the body weight [12]. They play significant roles which ranged from activation of enzymes, formation of pophyrins, and as trace bioactive substances [12]. Apart from the functions of trace elements, their deficiencies are marked with clinical symptoms or signs. Insufficient plasma or tissue levels of some trace elements can result in serious pathology cases. Tyrosinase, an enzyme that control the production of melanin is a copper containing enzyme and it is present in tissue. Melanosme, an organelle in which melanin is produced and stored is also

a zinc reservoir at subcellular level. Some trace elements when available in the body system serve as cofactor and as antioxidants. As antioxidants, they scavenge the reactive oxygen species known for oxidative stress [13].

Due to some dermatology complications and cancer associated with oculocutaneous albinism, there is need to ascertain the level of some trace elements in oculocutaneous albinism subjects. This may help to ascertain the etiology of some primary or secondary pathological condition suffered by the subjects and with that, a possible panacea may as well be fashioned with time. The present study investigated the serum level of some trace metals in oculocutaneous albinism subjects in Owerri metropolis.

MATERIALS AND METHODS

Study Area

This study was carried out in Owerri Metropolis. Owerri Metropolis houses the capital of Imo State. It is located in Southeast geopolitical zone of Nigeria within between Latitudes $5^0$24'N and $5^0$33'N and Longitudes $6^0$58'E and $7^0$06'E. Owerri Metropolis is found in tropical rainforest region of Nigeria. The population of Owerri Metropolis are unevenly distributed over a total land area of 57.966783km^2. It has a well-developed major and minor road with their access roads as well as streets to exist and enter the Metropolis. Owerri Metropolis houses majorly the Igbo speaking tribe of Nigeria, though few people from other tribes found in Nigeria also reside within. The inhabitants of Owerri metropolis are predominantly Christians with very few pagans and Muslims.

Study Population

A total of 60 volunteer subjects were used for this study, 30 subjects (15 male and 15 female) with oculocutaneous albinism were used as test and 30 subjects (15 male and 15 female) with normal skin pigmentation were used as control. Volunteered subjects fall within ages of 18-50 years. The 60 subjects were made possible by the Society of Albino, Imo State Chapter with the center in Owerri Municipal. With letter of introduction, the needed approval and ethical clearance were gotten. Each participant signed an informed consent form after the procedure and implications were explained using a language the subjects would understand. This study was conducted from March 2017 to April 2018. Volunteer subjects with sickness such as diabetes, obesity, heart failure, HIV, hepatitis, liver disease, kidney disease, dyslipidemia, sickle cell disease, history of any other chronic disease were excluded from the study. Also, volunteer subjects that were into cigarette smoking were excluded.

Blood Sample Collection

Five milliliters of venous blood was collected from each of the participants, and dispensed into the plain container. The collected blood sample was allowed to clot and the serum was separated. The separated serum was collected and stored appropriately under refrigeration and then used for further analysis.

Analysis of Serum Samples

Serum copper, zinc, and iron trace elements were analyzed following the instructions as contained in their kits.

Statistical Analysis

The mean and standard deviations of all the results generated were computed. Results were presented as mean ± standard deviation. Students t-distribution at 5% ($p<0.05$) level was used to compute significance. Asterisk (*) was used to depict significant values between corresponding bars of Figures 1-3.

RESULTS AND DISCUSSION

The results of trace elements in oculocutaneous albinism subjects as observed in the present study are presented in Figures 1-3. Levels of copper in oculocutaneous albinism subjects ranged from 84.08 to 97.38 µg/dl in male (Figure 1); 70.62 to 99.01µg/dl in female (Figure 2) and 82.08 to 98.19 µg/dl as mean for both male and female (Figure 3). Zinc ranged from 80.95 to 94.49 µg/dl in male (Figure 1); 80.65 to 94.23 µg/dl in female (Figure 2); and 80.81-87.76 µg/dl as mean for both male and female (Figure 3). Iron ranged from 80.99 to 85.83 µmol/l in male (Figure 1); 86.58 to 88.02 µmol/l in female (Figure 2); and 83.50 to 83.81 µmol/l as mean for both male and female (Figure 3).

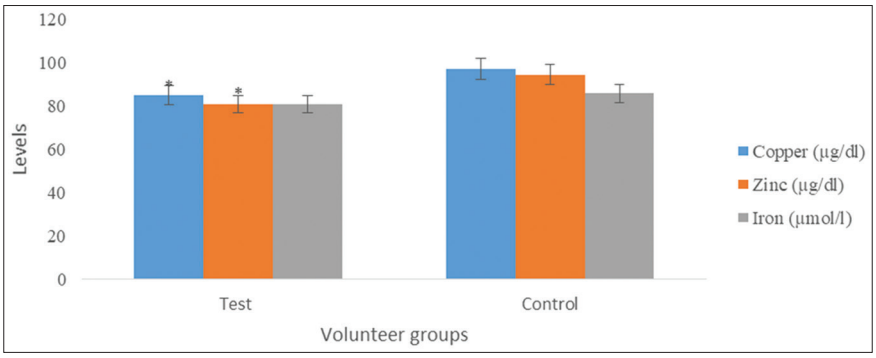

Figure 1: Mean level of trace elements in male oculocutaneous albinism subjects

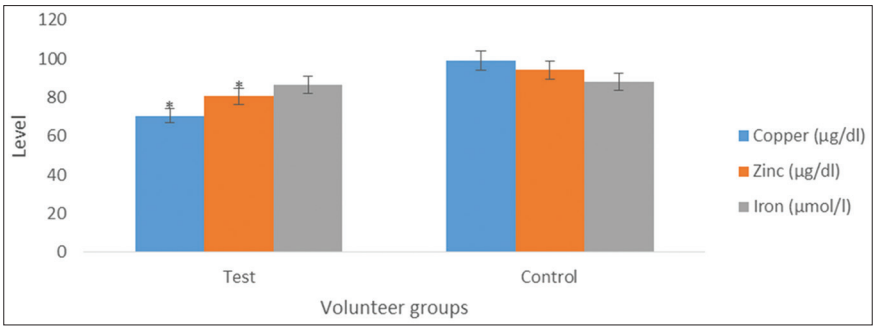

Figure 2: Mean level of trace elements in female oculocutaneous albinism subjects

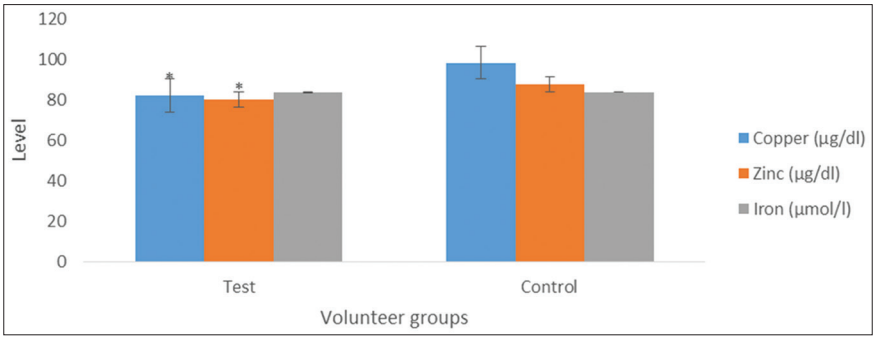

Figure 3: Mean level of trace elements in male and female oculocutaneous albinism subjects

The first two steps in melanin synthesis are catalyzed by tyrosinase. It has been reported that the gene of tyrosinase regulates both ocular and cutaneous melanin synthesis [14]. Copper is a component of tyrosinase enzyme and tyrosinase serve as oxidase enzyme in the production of melanin. There was a significant ($p<0.05$) decrease in serum copper levels of male (Figure 1) and female (Figure 2) oculocutaneous albinism subjects against the control. Mean significant ($p<0.05$) decrease in serum copper level was also observed for both male and female subjects (Figure 3). The observed decrease could mean a decrease in production of tyrosinase enzyme, which could invariably result in decreased production of melanin. The observation made on copper in this study is not in line with the work of Silverstone and Mendelsohn [15], who observed high mean copper concentration in serum of albinism group. Levels of zinc reduced ($p<0.05$) significantly in male (Figure 1) and female (Figure 2) oculocutaneous albinism subjects when compared to the control. Mean level of zinc for both male and female (Figure 3) oculocutaneous albinism subjects reduced ($p<0.05$) significantly against the control. The observed decrease in levels of both copper and zinc elements is not in agreement with the earlier study of Silverstone *et al.* [16], who reported distinctly elevated serum zinc in 7 patients of Caucasian albino group. The observed decrease in zinc could be in association to decrease in copper since both elements work in synergy. Iron in male (Figure 1), and female (Figure 2) oculocutaneous albinism subjects showed no significant ($p>0.05$) difference when compared to control subjects. There was no significant ($p>0.05$) different in the mean level of iron for both male and female oculocutaneous albinism subjects against the control subjects (Figure 3). This could be indication that iron has no connection with production of melanin or tyrosinase enzyme as the case maybe. Gruber and Holtz [17] noted that the role of iron in the skin pigmentation process is somewhat vague. The observation made on iron in this study is in line with the statement of Gruber and Holtz [17].

CONCLUSION

Levels of copper and zinc were reduce in albinism subjects against their controls. The same observation was made on their mean values. The decrease could mean decrease in melanin concentration or tyrosinase activity. This study has revealed the serum level of some trace elements in oculocutaneous albinism subject in Owerri Metropolis.

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