SERUM ZINC LEVELS IN EDEMATOUS AND NON-EDEMATOUS MALNOURISHED CHILDREN AT A TERTIARY CARE HOSPITAL

Mohsin Hayat[1], Mohammad Irshad[1], Mohammad Hussain[1], Zain Ullah[1], Humera Adeeb2, Ihsan Ullah[3]

[1]Department of Pediatrics, MTI Lady Reading Hospital, Peshawar - Pakistan

[2]Department of Nephrology, Institute of Kidney diseases, Hayatabad, Peshawar - Pakistan

[3]Depatment of Pathology (Microbiology) IBMS, Khyber Medical University, Peshawar - Pakistan

ABSTRACT

Objective: To determine the mean serum Zinc levels in malnourished children and compare serum Zinc levels in malnourished edematous and non-edematous children.

Material and Methods: This cross-sectional study was conducted in the Department of Pediatrics, Lady Reading Hospital Peshawar -Pakistan from May 2018 to Nov 2018.In this study total of 42 patients were enrolled during the six months period. Blood samples were collected from all patients under aseptic conditions before giving them intravenous fluids and were immediately transferred to the pathology laboratory for serum zinc levels. Data were collected using a pre-designed proforma and analysed for both edematous and non-edematous malnourished children.

RESULTS: The mean age of patients was 3 years (± 2.983). Out of total 42 patients, 19(45%) were males and 23(55%)were females whereas 15(35%) patients were edematous whie27(65%) were non-edematous. The mean serum Zinc level was 83.71(± 3.7)μg/dl in edematous and 86.65(±2.93) μg/dl in non-edmatous malnourished patients.

CONCLUSION: Mean serum Zinc levels were at the lower limit of the normal range in all malnourished children. The serum Zinc levels were however worse in edematousas compared to non-edematous malnourished children which could be due to interstitial edema.

Keywords: Edematous, malnourished, children, Serum, zinc levels, non-edematous.

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INTRODUCTION

Malnutrition is a global public health problem in children with wider implications. It increases the risk of mortality and morbidity due to infectious diseases. It is estimated that the underlying cause of 45% of deaths in pediatric patiets under the age of 5 years is due to malnutrition[1, 2]. The association between malnutrition and infections may in part be due to confounding by poverty, a determinant of both, but also possibly due to a two-way causal relationship. Malnutrition increases susceptibility to infections while infections aggravate malnutrition by decreasing appetite, inducing catabolism, and increasing demand for nutrients. Although it has been debated whether malnutrition increases incidence of infections, or whether it only increases severity of disease, solid data indicates that malnourished children are at higher risk of dying once infected[3]. The increased susceptibility to infections may in part be caused by impairment of immune function by malnutrition[4, 5].

The role of trace elements in human health and nutrition has attracted interest in the recent years[6]. Among different trace elements some are being widely investigated and their role in various aspects of growth and metabolism has been established. Zinc is an important trace element needed for the tissue synthesis and repair. Zinc plays its role both as a component of the new tissue formation and in the form of Zinc metalloenzymes essential for nucleic acid and protein synthesis[7]. Various studies highlight the importantace of Zincbecause it is stored in minute amount in the body, and there is a day to day requirement of dietary Zinc intake for the different body functions at cellular level[8].Children recovering from “Protein-energy” “malnutrition” gain more weight as compared to normal and they need a balance diet containing Zinc during this period. In that condition, more Zinc is required

Correspondence
Dr. Mohammad Hussain
Associate Professor
Head Unit C, Department of Pediatrics, Medical Teaching Institute, Lady Reading Hospital Peshawar - Pakistan
Email: drsaqiibali@gmail.com
Cell: 0092-333-9144439
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for growth of new tissue. When this is the case, dietary Zinc may both limit the absolute rate of weight gain and determine the composition of new tissue laid down.

Adams A, et al. has shown in a study conducted in 2016 that mean serum zinc levels were 87.75 ±3.3μg/dl in edematous malnourished children as compare to 102.7 ±1.9μg/dl in non-edematous malnourished children[9] and these results are in the normal range of 80-110mg/dl.Little is known about the difference in serum Zinc levels of malnourished children presenting withgeneralized body edema and those having no edema of the body.

Therefore, to get a local view of the Zinc deficient malnourished children among those having generalized edema of the body and those having no edema, and to recommend Zinc supplementationfor prevention of infections in these children, we planned this study tofind the serum Zinc levels in this group of children prensting to our departemt. Since it is estimated that malnutrition is the underlying cause of 45% of global deaths in children below the age of 5 years1 and this is due to the immunocompromised state and infections caused by multiple factors including Zinc deficiency.

MATERIALS AND METHODS

This case control study was conducted at the Pediatric Department Lady Reading hospital Peshawar-Pakistan from May 2018 to November 2018 after obtaining ethical approval from the institutional ethical committee. The objective of the study was to determine the mean serum zinc levels in malnourished children and compare the mean serum zinc levels in edematous and non edematous malnourished children. A total of 42 children in the age range 1-5 years males and females were enrolled through non-probability convenient sampling technique and after seeking informed consent from their parents. Patients with the history of congenital heart disease, endocrine disorders and those not consenting were exluded from the study.

Demographic information of patients was recorded through a structured proforma. Blood samples were collected from all patients before giving them any intravenous fluids and wereanalyzed inPathology department Lady reading hospital Peshawar. Data regarding serum Zinc levels from malnourished children presented with edema and non-edematous malnourished children were recorded on a proforma and then analyzed using SPSS version-22. Frequencies and percentages were computed for qualitative variables like gender, socio economic status, education of mother, residence. Mean ± SD was presented for quantitative variables like age, weight and serum zinc levels. The differences in the mean serum zinc levels of edematous and non-edematous malnourished children were statistically tested using the student t-test and $p \leq 0.05$ was considered statistically significant.

RESULTS

Gender distribution among 42 malnourished patients was analyzed. 19(45%)were males and 23(55%) were females. The number of malnourished female children was more as compared to males but there was no significant difference (p-value 0.934) between serum Zinc levels of both genders as shown in table 1.

Table 1: Gender distribution of malnourished children and their Zinc levels (N=42)

Gender	Frequency	Serum Zinc levels
Male	19 (45%)	84.3 ± 3.10 μg/dl
Female	23 (55%)	83.9 ± 3.7 μg/dl
Total	42 (100%)	

Table 2: Edematous and non-edematous malnourished patients with their mean serum Zinc levels (N=42)

Status of body Edema	Frequency	Mean Serum Zinc Levels
Edematous	15(35%)	83.71(± 3.7) μg/dl
Non edematous	27(65%)	86.65 (±2.93) μg/dl

DISCUSSION

Malnutrition in children is one of the major public health problems all over the world. Currently, it is associated with more than 41% of the deaths that occur annually in children from 6 to 24 months of age in developing countries, which is approximately 2.3 million. Worldwide, 165 million children below five years of age are affected with under nutrition and it can lead children to be at greater risk of death and severe illness due to common childhood infections, such as pneumonia, diarrhea, malaria, human immunodeficiency virus, or AIDS and measles. World Health Organization (WHO) in 2001 reported that 54% of all childhood mortality was attributable, directly or indirectly to malnutrition. In Pakistan 39.5% children are malnourished (underweight)[1,3].

Our study shows that mean age was 3 years with SD ± 2.98. Forty five percent children were male and 55% children were female. Thirty five percent patients were edematous while 65% patients were non edematous. Mean serum Zinc levels was 83.33 ± 3.8 μgl/dl.

Simialr results were observed in another study conduicted by Adam A, et al[9] in which mean serum zinc levels were 87.75 ±3.3μg/dl in edematous malnourished children as compare to 102.7 ±1.9μg/dl in non edematous malnourished children.

Similarly, a study conducted by Farhan J et al[10]. in 2009 where the mean serum Zinc levels were reported as 46.46 ± 1.36 μg/dl, 51.2±1.89µg/dl and56.36± 2.26 µg/dlrespectively amongseverlymalnourished preschool and school age childrenin Faisalabad in Pakistan. Our results

of serum Zinc deficiency were also simialrto another study conduicted by Anderson VP et al[11]. in 2008 in which mean serum zinc levels were 91.14 ± 2.98 μg/dl.

LIMITATIONS

The sample was small because the duration of study was six months as this data was collected for fellowship research and the condition is rare in our population.

CONCLUSION

Mean serum Zinc levels were at the lower level of normal range in non-edematous malnourished children. However non-edematous malnourished children had somehow better levels than edematous malnourished children where the serum Zinc levels were lower than the normal range. This could be a possible explaination of the repeated infections and lower metabolism in edematous malnourished children.

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AUTHOR'S CONTRIBUTION

Following authors have made substantial contributions to the manuscript as under

Hayat M: Data collection.

Irshad M: Statistics.

Hussain M: Main Idea.

Ullah Z: Bibliography.

Adeeb H: Data Collection.

Ullah I: Critical review.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.