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# Derangement Of Serum Zinc Level After Recovery Of Sars-Cov-2 Infection

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***ABSTRACT***
***Background:*** *COVID-19 pandemic has necessitated the search for the status of micronutrients such as serum zinc after recovery. Since 2019, the rapid spread of SARS-CoV-2 caused global emergency situation.No standard treatment is available for curing the disease. To support the immune response physicians are still dependant on active immunity, several minerals and vitamins with antioxidants. It is time to look for the changes of micronutrients after SARS-CoV-2 infection.*
***Aim of the study:****The aim of the study was to evaluate the quantative difference of serum zinc level in home and hospital treated patients.*
***Results:*** *The mean age for patients receiving home treatment is 46.50 years with a standard deviation of 12.54. The mean age for patients receiving hospital treatment is 43.84 years with a standard deviation of 12.95.Derangement of serum zinc was present in both study group after recovery from SARS-CoV-2. There was statistically significant difference of serum zinc level in home and hospital treated SARS-CoV-2 patients after recovery.*
***Materials and Methods:****Across-sectional study was conducted in the Department of Biochemistry and Molecular Biology, BSMMU, from July, 2020 to June, 2021. After infection most of the patients with mild symptoms were treated at home. Some patients developed various complications. They were treated at the hospital. Due to SARS-CoV-2 infection certain derangement of serum zinc was noticed.*
***Conclusion:*** *This study was planned to evaluate the changes of serum zinc after the recovery of SARS-CoV-2 infection in home and hospital treated patients.*
***Key words:*** *SARS-CoV-2, recovery, zinc, zinc deficiency, COVID-19.*

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## I. Introduction

A new strain of betacoronavirus called SARS-CoV-2 (Severe Acute Respiratory Syndrome-Coronavirus-2) caused COVID-19, one of the challenges for the world. At the end ofDecember 2019the SARS-CoV-2 infection first identified in Wuhan, China. Afterward the disease spread globally. Then WHO declared the disease as global pandemic[1]. Zinc deficiency provocates higher risk of chronic disease in elderly people. Duration and severity of SARS-CoV-2 infection depends on the amount of zinc in our body. Many studies found zinc supplementation was effective for preventing acute respiratory infection[2]. Zinc is an important catalyst in enzymatic activities.It acts as antioxidant component in immune system. Viral attachment to host cell often inhibited by zinc[3]. Zinc is a major structural and metabolic constituent of cell. In hospitalized older patients serum zinc deficiency is noticed. This leads to acute illness especially in old patients. Integumentary system, gastrointestinal tract, central nervous system, skeletal system are affected by zinc deficiency[4]. Most of the SARS-CoV-2 diagnosed patients suffer from fever, sore throat, cough, lung infections.Butin complicated cases development of acute respiratory distress syndrome (ARDS), sepsis and which progress to death. Many of the patients had history of at least one of the comorbidities when diagnosed as SARS-CoV-2 patient. Hypertension, diabetes, chronic obstructive pulmonary disease (COPD), obesity and cardiovascular diseases were mostly reported[5]. Elderly people and history of diabetes, hypertension and pulmonary disease get more infection by SARS-CoV-2. In addition to mineral deficiency like zinc can effect the disease severity[6]. After zinc deficiency SARS-CoV-2 entry into the cell may be facilated by decreasing ACE-2 expression[7]. A common manifestation of SARS-CoV-2 infection is anosmia with loss of appetite. Zinc deficiency can cause the loss of olfactory perception. But the taste and smell sensation may be improved by zinc supplementation[8]. The physiological function of zinc is cellular growth, maturation of immune cells most importantly the development

and activation of T-lymphocytes. An important property if zinc as a trace element is immunoregulation and antiviral property. Inhibition of RNA synthesis, topoisomerase and viral replication are the mechanism of antiviral property of zinc in our body[9]. Serum zinc shows important role in T cell mediated function.Zinc deficiency depress lymphocyte proliferation, interleukin-2 (IL-2) production, delayed-type hypersensitivity skin responses, and antibody response to T cell dependent antigens[10]. Zinc provides antioxidant and anti inflammatory activity which promotes essential barrier function of mucosal epithelium. Zinc also maintains the mucosal membrane integrity regulated by tight junction. Zinc deficiency causes reduction of mucosal integrity and loss of tight junction cohesion. This condition aggravates viral inflammation. Zinc regulates proliferation, differentiation, maturation and functioning of leucocytes including lymphocytes. But there are some harmful effects of excess zinc in body. Impairment of immune response by inhibiting T–lymphocyte and B–lymphocyte function, reducing intracellular pathogen, destruction in macrophages or inducing an overload of regulatory T–cells are some of them[11]. Zinc plays important role in supporting the immune system. It acts as cofactor of antioxidant enzymes to make our body protected from oxidative stress[12]. Micronutrients like zinc is fundamental for immune cell function, protection against oxidative stress and it exerts a healthy inflammatory response with some anti-viral effects[13]. With certain antiviral activity, zinc inhibit viral replication in host cell. Poor dietary intake of zinc facilitate viral infection. For boosting our immunity and preventing viral infection adequate micronutrient like zinc should be taken[14]. Zinc regulates the function of immune cells such as NK cells, monocytes, neutrophils and T and B lymphocytes. The structure and function of the respiratory epithelium barrier are also maintained by zinc[15]. Various physiological and environmental factors increase the risk of COVID-19 severity. Along with inflammatory response and anti viral activity zinc directly inhibit SARS-CoV replication[16]. Zinc deficiency is associated with excessive TNF-α and IL-6 activity. These factors known to have a significant role in cytokine release syndrome[17]. Lower serum zinc levels below 50 µg/dL at admission reported with worse clinical presentation, increased duration to reach stability and higher mortality. Zinc supplementation is needed for prophylaxis and treatment of SARS-CoV-2 infection[18].Zinc has obvious important function on human body. Zinc deficiency loosens human body immunity against pathogens like SARS-CoV-2. Meanwhile overactive immune response can cause tissue damage[19]. Hypozincemia could be a predictive factor for a critical illness of COVID-19[20].

## II. Materials and Methods

From July, 2020 to June, 2021, this cross-sectional study was conducted at Department of Biochemistry and Molecular Biology, BSMMU, Shahbag, Dhaka. The total study subject was 100. All of them were confirmed as infected case of SARS-CoV-2 and recovered (50 home-treated patients were taken as group I and another 50 hospital-treated patients were taken as group II). The patients with mild symptoms and treated at home were enrolled as home treated patients. RT-PCR positive for SARS-CoV-2, age 18 to 70 years were inclusion criteria for both group I and II. All the study subjects were non vaccinated against SARS-CoV-2 virus. Pregnancy, lactation, chronic liver and renal disease, history of heart failure, history of malignancy, any immunosuppressive disorders and radiation therapy were excluded from the study. A structured questionnaire and data sheet were prepared for this research, which included all the variables of interest. With all aseptic precautions blood sample was collected. The serum was separated from individual sample and stored at -56ºC. Estimation of serum magnesium was performed at the Department of Biochemistry and Molecular Biology, BSMMU. Collected data were entered, checked and edited (to remove the outliers) with the help of the Statistical Package for Social Sciences (SPSS) software, version 26 and analyzed. The data were expressed as frequency and percentage, mean ± SD for normally distributed data. P value ≤0.05 was considered statistically significant.

## III. Results

**Table I: Age distribution of the study population**

| Age group (years) | Home Treated (n=50) | Hospital Treated (n=50) |
|---|---|---|
| 20-29 | 3 (6.0%) | 9 (18.0%) |
| 30-39 | 15 (30.0%) | 14 (28.0%) |
| 40-49 | 6 (12.0%) | 5 (10.0%) |
| 50-59 | 19 (38.0%) | 17 (34.0%) |
| 60-70 | 7 (14.0%) | 5 (10.0%) |
| Total | 50 (100.0%) | 50 (100.0%) |
| Mean ± SD | 46.50 ±12.54 | 43.84±12.95 |

Derangement of serum zinc was present in both study group after recovery from SARS-CoV-2. The mean age for patients receiving home treatment is 46.50 years with a standard deviation of 12.54. The mean age for patients receiving hospital treatment is 43.84 years with a standard deviation of 12.95.

**Table II: Derangement of serum zinc level between home and hospital treated patients**

| | | Frequency | Percentage |
|---|---|---|---|
| Home treated | Below normal level | 2 | 4 |
| patients (50) | Normal level | 17 | 34 |
| | Above normal level | 31 | 62 |
| Hospital treated patients (50) | Below normal level | 1 | 2 |
| | Normal level | 19 | 38 |
| | Above normal level | 30 | 60 |

There was statistically significant difference of serum zinc level in home and hospital treated SARS-CoV-2 patients after recovery.

**Table III: Mean of serum zinc in SARS-CoV-2 home and hospital treated patients**

| | Home treated patient | Hospital treated patient |
|---|---|---|
| Zn (µg/dL) (Mean ± SD) | 208.08 ± 175.83 | 146.72 ± 110.65 |

The mean serum zinc level forSARS-CoV-2 home-treated patients is higher than that for hospital-treated patients.

**Table IV: Comparison of serum zinc value between home and hospital treated patients**

| | Home treated patient | Hospital treated patient | p-value |
|---|---|---|---|
| Zn (µg/dL) (Mean ± SD) | 208.08 ± 175.83 | 146.72 ± 110.65 | 0.04 |

Home-treated patients, on average, have higher serum zinc levels compared to hospital-treated patients.

## IV. Discussion

In this study the mean age of the respondents of home and hospital treated groups were 46.50 ±12.54 and 43.84±12.95 years respectively. 38.0% home treated and 34.0% hospital treated patients were within 50-59 years age group. This result was consistent with Nikpouraghdam et al. a recent study in Iran. The study reported that the majority SARS-CoV-2 infected patients were in the age group of 50 to 60 years old[21]. Derangement of serum zinc is noticed in both group. In this study, 62% home treated and 60% hospital treated patients were found with serum zinc level more than normal. A study in Riyadh city noticed that mean level of zinc were elevated in severe SARS-CoV-2 patients in comparison to non severe group[1]. A recent study in Chennai reported significant number of SARS-CoV-2 patients had lower level of zinc. These patients were noticed with prolonged hospital stay, development of complications and increased mortality rate[9].The present study reported that there was significant difference ofmean ± SD value in between home and hospital treated patients ($p < 0.05$). But another study in India reported that statistically significant difference of serum zinc level were noticed between COVID-19 patients and control group( $p < 0.0001$ )[15].

## V. Conclusion

After recovery both home and hospital treated patients had increased zinc level. There was statistically significant difference of zinc status between home and hospital patients.

## References

[1]. Alkattan A, Alabdulkareem K, Kamel A, Abdelseed H, Almutairi Y, Alsalameen E. Correlation Between Micronutrient Plasma Concentration And Disease Severity In Covid-19 Patients. Alexandria Journal Of Medicine. 2021;57(1):21-7.
[2]. Arentz S, Hunter J, Yang G, Goldenberg J, Beardsley J, Myers Sp, Mertz D, Leeder S. Zinc For The Prevention And Treatment Of Sars-Cov-2 And Other Acute Viral Respiratory Infections: A Rapid Review. Advances Inintegrative Medicine. 2020;7(4):252-60.
[3]. Elham As, Azam K, Azam J, Mostafa L, Nasrin B, Marzieh N. Serum Vitamin D, Calcium, And Zinc Levels In Patients With Covid-19. Clinical Nutrition Espen. 2021;43:276-82.
[4]. GauJt, Ebersbacher C, Kao Tc. Serum Zinc Concentrations Of Adults In An Outpatient Clinic And Risk Factors Associated With Zinc Deficiency. Journal Of Osteopathic Medicine. 2020;120(11):796-805.
[5]. Gordon Am, Hardigan Pc. A Case-Control Study For The Effectiveness Of Oral Zinc In The Prevention And Mitigation Of Covid-19. Frontiers In Medicine. 2021;8.
[6]. Hosseini Sj, Moradi B, Marhemati M, Firouzian Aa, Ildarabadi E, Abedi A, Firooz M. Comparing Serum Levels Of Vitamin D And Zinc In Novel Coronavirus–Infected Patients And Healthy Individuals In Northeastern Iran, 2020. Infectious Diseases In Clinical Practice. 2021;29(6):E390-4.
[7]. Razeghijahromi S, Moradi Tabriz H, Togha M, Ariyanfar S, Ghorbani Z, Naeeni S, Haghighi S, Jazayeri A, Montazeri M, Talebpour M, Ashraf H. The Correlation Between Serum Selenium, Zinc, And Covid-19 Severity: An Observational Study. Bmc Infectious Diseases. 2021;21(1):1-9.

[8]. JoachimiakMp. Zinc Against Covid-19? Symptom Surveillance And Deficiency Risk Groups. Plos Neglected Tropical Diseases. 2021;15(1):E0008895.
[9]. Jothimani D, Kailasam E, Danielraj S, Nallathambi B, Ramachandran H, Sekar P, Manoharan S, Ramani V, Narasimhan G, Kaliamoorthy I, Rela M. Covid-19: Poor Outcomes In Patients With Zinc Deficiency. International Journal Of Infectious Diseases. 2020;100:343-9.
[10]. Meydani Sn, Barnett Jb, Dallal Ge, Fine Bc, Jacques Pf, Leka Ls, Hamer Dh. Serum Zinc And Pneumonia In Nursing Home Elderly. The American Journal Of Clinical Nutrition. 2007;86(4):1167-73.
[11]. MossinkJp. Zinc As Nutritional Intervention And Prevention Measure For Covid–19 Disease. Bmj Nutrition, Prevention & Health. 2020;3(1):111.
[12]. Muhammad Y, Kani Ya, Iliya S, Muhammad Jb, Binji A, El-Fulaty Ahmad A, Kabir Mb, Umar Bindawa K, Ahmed Au. Deficiency Of Antioxidants And Increased Oxidative Stress In Covid-19 Patients: A Cross-Sectional Comparative Study In Jigawa, Northwestern Nigeria. Sage Open Medicine. 2021;9:2050312121991246.
[13]. 13.Marcos A. A Review Of Micronutrients And The Immune System—Working In Harmony To Reduce The Risk Of Infection. Nutrients. 2021 Nov;13(11):4180.
[14]. Pour Ob, Yahyavi Y, Karimi A, Khamaneh Am, Milani M, Khalili M, Sharifi A. Serum Trace Elements Levels And Clinical Outcomes Among Iranian Covid-19 Patients. International Journal Of Infectious Diseases. 2021;111:164-8.
[15]. Pvsn Kk, Tomo S, Purohit P, Sankanagoudar S, Charan J, Purohit A, Nag V, Bhatia P, Singh K, Dutt N, Garg Mk. Comparative Analysis Of Serum Zinc, Copper And Magnesium Level And Their Relations In Association With Severity And Mortality In Sars-Cov-2 Patients. Biological Trace Element Research. 2022:1-8.