

Clinical and Biochemical Indicators with Zinc Consumption in Geriatric Patients at Geriatric Clinic in Medical City

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ABSTRACT:

BACKGROUND:

The need of micronutrients in nutrients and human fitness is unquestionable and zinc (Zn) is a vital hint detail whose significance has been particularly outstanding in getting older, and immune senescence. Its deficiency is common within the aged and ends in numerous age-associated continual ailments together with atherosclerosis, degenerative illnesses of the fearful gadget, immunosenescence, and cancer.

OBJECTIVE:

The goal of this study is to estimate the ability position of the zinc supplementation in older patients whose aged 65 years and more, as a way to repair the immune reaction and the primary consequences of zinc on immune senescence with relation to gender and fitness kingdom, also to proof the history of infection by coronavirus 2 (SARS-CoV-2) among the studied sample.

PATIENTS AND METHODS:

This study covered 415 patients aged of 60 -89 years of both genders in a cross sectional study from January –April 2021 at geriatric health facility in Baghdad Teaching Hospital / Medical City and was classified according to usage of zinc supplement in the previous 6 months. The results of investigation were then compared to their archived data. Analytic study with the aid of using SPSS had been executed to evaluate the frequency of zinc intake in aged. The p value < 0.05 was significant.

RESULTS:

Among males who constitute 63.4 % of studied patients, 49.8% were using zinc in comparison with 37.5 % among females. The percentage of zinc intake as medical treatment was 62.8 % and 37.2% as a prophylaxis.

CONCLUSION:

The Nutritional interventions, inclusive of the supplementation of nutrients and minerals, make a contribution to latent therapeutic plan for COVID-19, appearing additionally to alter glucose and lipid level in blood.

KEYWORDS: zinc supplement (Zn supplement), immunosenescence, micronutrient.

INTRODUCTION:

Aging is related to a lower in adaptive and innate immunity, in addition to a multiplied threat of dietary problems. It triggers a chain of physiological, biochemical, biological, and mental adjustments that regulate ones bodily interest, standard behavior, consuming patterns, and social interactions⁽¹⁾. Biological aging is a complicated process that involves adjustments in all cells, particularly within the immune tool.

Immunosenescence is a disorder where in the immune system's (innate and adaptive)

responses become abnormally regulated over time, thereby causing a low - grade inflammatory state and raising the vulnerability to infections^(2,3,4).

In the aged, good enough nutrients is crucial for retaining fitness and immune competence. Zinc is a vital micronutrient in particular way to its biological, biochemical, and immune capabilities⁽⁵⁾. There is no set age for Elderly patients. Most developed countries have standard the chronological age of 65 years as a characterization of elderly individuals, as stated by The World Health Organization (WHO). On the alternative hand, the United Nations has agreed that a reduce of 60+ years constitute vintage age. Regardless, the a while of 60 and sixty five years are frequently used equal to retirement a while^(6,7,8).

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Low zinc dietary intake, poor dentition, oral diseases, and the loss of dental fragments are all not unusual place troubles the various aged. Some nutritional adjustments are caused by the elderlies, lack of ability to masticate properly, as this would induce the tendency to replace some zinc-rich foods, such as red meat or hard cheese, with more soft zinc-poor foods, bread for instance. The fractional zinc absorption decreases whilst nutritional availability increases, and with aging; zinc absorption is lower than in young adults. The presence of binding zinc or blocking its action as phytates and different minerals (iron and calcium) in the diet act as inhibitors⁽⁹⁾.

The deficiency of zinc develops with following lack of appetite, and weakened immune competences. Many clinical evidences follow this, including hair loss, diarrhea, impotence, eye and skin lesions, weight loss, delayed wound healing, taste and flavor abnormalities and intellectual lethargy⁽¹⁰⁾.

Medication can motive appetite, olfactory, and taste abnormalities, all of that have an impact on nutritional rank. Because elderly patients often have multiple daily medication treatments, there is an excessive risk of drug interactions affecting the absorption⁽¹¹⁾.

Some psychosocial factors may have a major effect on nutritional behavior and, as a result, low zinc intake. In addition, marital status, depression, mental wellbeing, education, socioeconomic status, dietary habits, and convenience all play a role in adequate intake^(12,13).

Diet can be insufficient and micronutrient supplementation can be required. Owing to the impact of zinc on immune functions, metabolic harmony, and antioxidant effect, zinc vitamins assist with an extension of even the maximum life span, and to escape certain age-related diseases, as well as limit the probability of the incidence of illnesses and the ensuing impairment. Multivitamins as vitamins A, C, D, E, B2, B6, and B12, folic acid, iron, selenium, and zinc are a number of the primary micronutrients obligatory to advance a normal immune response (immune competence)⁽¹⁴⁾.

Zinc deficiency promotes the neurodegenerative disorders risk by impacting neurogenesis and raising neuronal apoptosis, which each can end result learning and reminiscence deficits. Zinc deficiency has been related to depression,

cerebral aging, Parkinson's disease, and Alzheimer's disease⁽¹⁵⁾.

There is a striking similarity between the changes reported in immunosenescence and those linked to Zinc deficiency, amongst them a reduction of thymus activity and its hormones, a deviation of T helper cells, a decrease of the response to vaccines, and a deterioration of innate immune cell (phagocytes) function⁽¹⁶⁾.

The daily needs of Zn supplementation in the elderly differ by populations, therapeutic dosages are not standardized, and excessive Zinc administration can motive toxic consequences and immune system side effects⁽¹⁷⁾. Its toxicity is relatively unusual. High nutritional intake can cause nausea, vomiting, epigastric pain, lethargy, fatigue, and a decline in the immune response collectively with neutropenia, macrocytic anemia, sideroblastic anemia and reduced copper level in blood^(18,19).

PATIENTS AND METHODS:

A cross sectional study had covered 415 elderly patients of age range 60-89 years of each gender from 1st January- 1st April 2021. The patients have been cared by geriatric clinic in Baghdad Teaching Hospital/ Medical City and had previous information data. After taking history and clinical examination, laboratory investigation was done. Patients were classified according to usage of zinc supplement in previous 6 months during the pandemic. The results of new investigations were compared with previous archived data. Statistical Package for Social Science (SPSS) was used for data analysis to find out t-test and chi² test (P- value <0.05 was significant).

Inclusion criteria were determined as "elderly patients who consulted the Geriatric Clinic in Baghdad Teaching Hospital". Studied group was selected on consecutive sampling. Geriatric Clinic provides health care for patients older than 60 years old according to the administrative instructions of Iraqi Ministry of Health and Ministry of Labor and Social Affairs.

The mean age of patients was 70.73 ± 7.46 years. Two thirds of them (63.4 %) were males with a mean age of 72.61 ± 6.8 years while, one third of them (36.6%) were females with a mean age of 67.68 ± 5.08 years.

RESULTS:

Elderly patients were classified according to their usage for zinc supplement as shown in Table 1.

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Table 1: Distribution of geriatric patients by zinc usage and health state.

	With zinc (188)		Without zinc (227)		Total (415)		
	NO.	%	NO.	%	NO.	%	
Gender							
Male	131	69.7	132	58.1	263	63.4	P – value 0.02
Female	57	30.3	95	41.9	152	36.6	
Age group							
60 -- 69 years	88	46.8	102	44.9	190	45.8	P – value 0.77
70 --79 years	75	39.9	104	45.8	179	43.1	
80 –89 years	25	13.3	21	9.3	46	11.1	
Marital state							
Married	130	69.1	146	64.3	276	66.5	P – value 0.35
Widow	55	29.3	69	30.4	124	29.9	
Single	3	1.6	12	5.3	15	3.6	
Education							
Illiterate	42	22.3	88	38.8	130	31.3	P – value 0.109
Primary	55	29.3	75	33	130	31.3	
Secondary	55	29.3	43	18.9	98	23.6	
Higher	36	19.1	21	9.3	57	13.8	
Smoking state							
Smoking current	55	29.3	61	26.9	116	28	P – value 0.66
No smoking habit	119	63.3	153	67.4	272	65.5	
X- SMOKER	14	7.4	13	5.7	27	6.5	
Past medical history							
Diabetes mellitus	104	55.3	146	64.3	250	60.2	P – value 0.078
Hypertension	135	71.8	182	80.2	317	76.4	P – value 0.06
Ischemic heart disease	109	58	131	57.7	240	57.8	P – value 1.00
Respiratory disease	9	4.8	4	1.8	13	3.1	P – value 0.139
COVID -19	118	62.8	62	27.3	180	43.4	P – value 0.00

The frequency of zinc consumption among the

studied sample was 45.3%, more in male (69.7 %) than female (30.3%).

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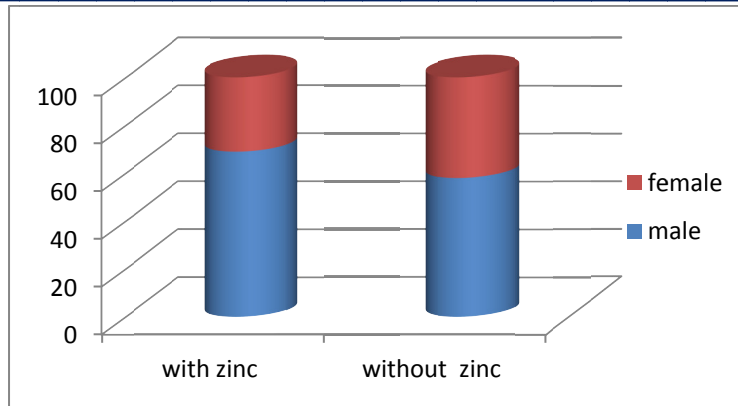


Fig 1: Distribution of geriatric patients by zinc usage.

Results of this study showed that most common medical management 62.8 % and only 37.2% as geriatric patients used zinc supplement as part of a prophylaxis to enhance immune response.

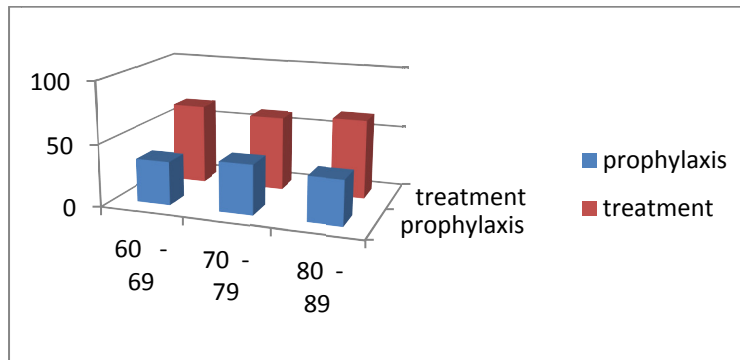


Fig 2: Distribution of geriatric patients by zinc usage and their target.

The rate of zinc consumption in relation to history of corona virus infection showed that (62.8 %) of positive history for COVID- 19 were using zinc supplement with significant difference (P – value = 0.00).

Table 2: Distribution of geriatric patients by zinc usage and history of COVID-19.

zinc consumption	History of COVID -19 +ve(180)		History of COVID -19 - ve(235)		Total (415)	
	NO.	%	NO.	%	NO.	%
Zinc used	118	62.8	70	37.2	188	45.3
Zinc alone	4	2.2	1	0.4	5	1.2
Zinc with multivitamin	95	52.8	45	19.2	140	33.7
Zinc with citrus fruit	19	10.6	24	10.2	43	10.4
Without zinc	62	27.3	165	72.7	227	54.7
Citrus fruit alone	27	15	55	23.4	82	19.8
Multivitamin alone	3	1.7	2	0.85	5	1.2
Without any supplements	32	17.7	108	45.95	140	33.7

The study demonstrated that recurrent duration for zinc consumption was two weeks (52.1%) and more than half (53.4) at age 60-69years.

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Table 3: Distribution of geriatric patients by zinc usage and their duration.

Duration For zinc consumption	60-69 (88)		70- 79 (75)		80-89 (25)		Total (188)	
	NO.	%	NO.	%	NO.	%	NO.	%
1 week	15	17.1	19	25.33	6	24	40	21.3
2 week	47	53.4	37	49.34	14	56	98	52.1
More than 2 week and less or equal 4 week	23	26.1	16	21.33	2	8	41	21.8
More than 4 week	3	3.4	3	4	3	12	9	4.

The influence of zinc usages with common biochemical and clinical indicators was demonstrated in table (4) that showed a significant difference with lipoprotein and zinc consumption (P – value = 0.001) in spite of no significant difference with total cholesterol (P – value = 0.438).

Table 4: Distribution of geriatric patients by zinc usage and indicators.

Indicators	Mean before	Mean after	P value Paired T –test
Body mass index	29.84	29.82	0.892
Systolic blood pressure	151.6	148.2	0.000
Hemoglobin	12.1	13	0.127
Total Cholesterol	197.9	198.4	0.438
Low density lipoprotein	119.3	118	0.001
High density lipoprotein	36.5	37.2	0.001
Triglyceride	189.9	184.4	0.000
HbA1c	9.65	9.29	0.000

DISCUSSION:

Multiple anatomical, societal, psychological, and financial variables vicinity the elders liable risk of malnutrition. With age, physiological functions deteriorate, which have an effect absorption and metabolism. Social and economic elements predispose dietary preferences and consuming habits⁽²⁰⁾. The elderly have higher dietary requirements (such as vitamins, nutrients, and proteins) compared to younger people. Zinc (Zn) is crucial for elderly's behavioral and mental health, immune and antioxidant systems, and bone metabolism⁽²¹⁾.

The existence of zinc consumption was better at age group 60 -69 years (46.8 %) than different other age group and 62.8% regarded zinc as a medical treatment for SARS COVID-19 while 37.2 % as a prophylaxis. The most frequent duration for zinc consumption was two weeks (52.1%).

In 2016, Junaidah B. Barnett et al revealed that about 30 mg/day of zinc supplementation for three months is powerful in elevating serum zinc level in elderly.

However, not all zinc-deficient elderly attained sufficient concentrations even after three months⁽²²⁾.

In a study published in 2020, Mary L. Fantacone et al⁽²³⁾ reported that mineral and multivitamin supplement taken by study participants for 12 weeks, significantly increased zinc level. Although his study found no statistically differences in immune responses, but did find a statistically significant reduction in the duration and severity of illnesses⁽²³⁾.

Though more than three - quarter were hypertension, 60 % diabetic, and 57.8 % ischemic heart, their use for zinc supplement was less than expected. This can be traced to drug interaction or doubt about their antioxidant effect.

The World Health Organization declared the coronavirus disease 2019 a global pandemic. A balanced diet and nutrition are mandatory for an optimal immune reaction. Amongst other nutritional components with high anti-inflammatory and antioxidant capacity, as zinc,

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vitamin E, and vitamin C during the COVID-19 crisis will enhance the immunity⁽²⁴⁾.

According to current statistical research, COVID-19 infections in the elderly, are most common and with those in their 70s and 80s being the hardest hit, together with people who work indoors, residents in nursing homes and hospital settings, ethnic minorities, and those who are overweight or obese. Poor diet, lack of sunlight exposure, darker skin pigmentation, co-morbidities, multi medications, social deprivation, economic status, and additionally lifestyle habits like smoking and heavy alcohol intake constitute feasible risk factors⁽²⁵⁾.

The association between micronutrients and COVID-19 infection is still being researched. Frequent hand washing and social distancing are essential, to lessen transmission and no medical nutritional therapy alone can prevent or cure the infection.⁽²⁶⁾

Zinc deficiency predominantly in the elderly, is very widespread, and diagnosis can be challenging due to the absence of clinical features and reliable biochemical markers, as well as the lack of an accurate and effective zinc biomarker. The recommended daily zinc intake is determined by included issues of age, gender, weight, and the content of phytate in the diet.

Zinc supplementation ought to be evaluated on an individual foundation, taking into account cases of zinc deficiency, low dietary intake, and associated diseases. According to researched zinc supplementation with different doses and duration, 20–40 mg/day respect as an effective dosage and safe^(27,28).

The current study confirmed a significant association between change in lipoprotein level and practice of zinc supplement ($p=0.001$). Such result approves with a systematic review and meta-analysis for Zinc supplementation effects on serum lipids: by Priyanga Ranasinghe et al in 2015. They demonstrated that zinc supplementation significantly decreased total cholesterol, low-density lipoprotein (LDL) cholesterol and triglycerides. Additionally, an elevation in high-density lipoprotein (HDL) cholesterol is also caused. As a result, it lowers the prevalence of atherosclerosis, as well as associated morbidity and mortality, especially in non-healthy patients at risk of atherosclerosis⁽²⁹⁾.

Although several studies have demonstrated that low zinc level is related with diabetes, the effects of

zinc supplementation on glycemic control are inconclusive, but this study found a significant

association between zinc supplement and blood glucose level (0.000). This finding is consistent with a study published in 2019 by Xinhui Wang et al, who found that zinc supplementation lowers glycemic indicators significantly, mainly in diabetic patients. These results reinforce the idea that zinc supplementation may be used as an adjunct therapy to avoid or manage diabetes⁽³⁰⁾. Hypertension was defined as systolic blood pressure equal or more than 130 mmHg and /or diastolic blood pressure equal or more than 80 mmHg or treatment with hypertensive medications as stated by the American College of Cardiology and American Heart Association guideline 2017. This study showed a significant lessening in systolic blood pressure among zinc supplements users (0.000) but this result was not compatible with a study by Jie Yao et al in 2018 who found no significant association between hypertension and zinc intakes⁽³¹⁾.

The balanced dietary habits, which embrace variety of antioxidants to maintain the immunity, have become progressively appropriate during the current SARS-CoV-2/COVID-19 pandemic, that are characterized by high oxidative stress. Moreover, government responses to the pandemic have resulted in a rise in anxiety, stress, and depression, all of which have an effect on physical and mental health and are influenced by diet, nutritional status, and lifestyle⁽³²⁾.

CONCLUSION:

*Zinc supplementation has an assistant role in health-promoting activity, management of diabetes and cardiovascular disease and aimed at improving physiological and cognitive functions in the elderly and reducing the global burden of infection.

*Enhance nutrition screening and dietary assessment into the health care system and develop comprehensive preventive strategies based on individualized nutritional needs.

*A diet high in fruit and vegetables with adequate dietary protein, supports lean body mass maintenance.

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REFERENCES:

1. Meunier N, Feillet-Coudray C, Rambeau M, Andriollo-Sanchez M, Brandolini-Bunlon M, Coulter SJ, Cashman KD, Mazur A, Coudray C. Impact of micronutrient dietary intake and status on intestinal zinc absorption in late middle-aged men: the ZENITH study. *Eur J Clin Nutr.* 2005;59:S48–S52.
2. Alonso P, De la Fuente M. Role of the immune system in aging and longevity. *Curr Aging Sci.* 2011;4:78–100.
3. Lang PO, Govind S, Michel JP, Aspinall R, Mitchell WA. Immuno senescence: implications for vaccination programs in adults. *Maturitas.* 2011;68:322–30.
4. Pawelec G, Larbi A, Derhovanessian E. Senescence of the human immune system. *J Comp Pathol.* 2010;142:S39–S44.
5. Hambidge KM. Micronutrient bioavailability: dietary reference intakes and a future perspective. *Am J Clin Nutr.* 2010;91(Suppl 1):1430S–1432S. [
6. United Nation, Department of Economic and Social Affairs, Population Division (2017). *World Population Aging 2017: Highlights.* ST/ESA/SER.A/397.
7. Naja S, Makhlof MM, Chehab MA. An aging world of the 21st century: a literature review. *International Journal of Community Medicine and Public Health.* 2017;4:4363–69.
8. Orimo H, Ito H, Suzuki T, Araki A, Hosoi T, Sawabe M. Reviewing the definition of elderly. *Geriatrics and Gerontology International.* 2006;6:149–58.
9. van der Putten GJ, Vanobbergen J, De Visschere L, Schols J, de Baat C. Association of some specific nutrient deficiencies with periodontal disease in elderly people: a systematic literature review. *Nutrition.* 2009;25:717–22.
10. Evans GW. Zinc and its deficiency diseases. *Clin Physiol Biochem.* 1986;4:94–98.
11. Genser D. Food and drug interaction: consequences for the nutrition/health status. *Ann Nutr Metab.* 2008;52:29–32.
12. Malavolta M, Giacconi R, Piacenza F, Santarelli L, Cipriano C, Costarelli L, Tesi S, Pierpaoli S, Basso A, Galeazzi R, Lattanzio F, Mocchegiani E. Plasma copper/zinc ratio: an inflammatory/nutritional biomarker as predictor of all-cause mortality in elderly population. *Biogerontology.* 2010;11:309–319.
13. Mocchegiani E, Malavolta M, Lattanzio F, Piacenza F, Basso A, Abbatecola AM, Russo A, Giovannini S, Capoluongo E, Bustacchini S, Guffanti EE, Bernabei R, Landi F (2011) Cu to Zn ratio, physical function, disability, and mortality risk in older elderly (iLSIRENTE study). *AGE* (in press).
14. Ángel Julio Romero Cabrera Zinc, aging, and immunosenescence: an overview *Pathobiol Aging Age Relat Dis.* 2015; 5: 10.3402/pba.v5.25592.
15. Roohani N, Huvell R, Kelishadi R, Schulin R. Zinc and its importance for human health: an integrative review. *J Res Med Sci.* 2013;18:144–57.
16. Haase H, Mocchegiani E, Rink L. Correlation between zinc status and immune function in the elderly. *Biogerontology.* 2006 Oct-Dec;7(5-6):421-8.
17. Pae M, Meydani SN, Wu D. The role of nutrition in enhancing immunity in aging. *Aging Dis.* 2012;3:91–129.
18. Trinch C. Immunity and nutrition. In: Morley JE, Thomas DR, editors. *Geriatric nutrition.* Boca Raton. FL: CRC Press; 2007: 69–102.
19. Sheqwara J, Alkhatib Y. Sideroblastic anemia secondary to zinc toxicity. *Blood.* 2013;122:311.
20. Julie Shlisky, David E Bloom, Amy R Beaudreault, Katherine L Tucker, Heather H Keller, Yvonne Freund-Levi, Roger A Fielding, Feon W Cheng, Gordon L Jensen, *Nutritional Considerations for Healthy Aging and Reduction in Age-Related Chronic Disease* 2017;8:17–26.
21. Wilma Leslie, Catherine Hankey *Aging, Nutritional Status and Health Healthcare (Basel)* 2015; 3: 648–58.
22. Junaidah B Barnett, Maria C Dao, Davidson H Hamer, Ruth Kandel, Gary Brandeis, Dayong Wu, Gerard E Dallal, Effect of zinc supplementation on serum zinc concentration and T cell proliferation in nursing home elderly: a randomized, double-blind, placebo-controlled trial. *The American Journal of Clinical Nutrition, Volume 103, Issue 3, March 2016: 942–51.*
23. Fantacone ML, Lowry MB, Uesugi SL, Michels AJ, Choi J, Leonard SW, Gombart SK, Gombart JS, Bobe G, Gombart AF. The Effect of a Multivitamin and Mineral Supplement on Immune Function in Healthy Older Adults:

ZINC CONSUMPTION IN GERIATRIC PATIENTS

- A Double-Blind, Randomized, Controlled Trial. *Nutrients*. 2020;12:2447.
24. Iddir M, Brito A, Dingo G, Fernandez Del Campo SS, Samouda H, La Frano MR, Bohn T. Strengthening the Immune System and Reducing Inflammation and Oxidative Stress through Diet and Nutrition: Considerations during the COVID-19 Crisis. *Nutrients*. 2020;12:1562.
 25. Richardson DP, Lovegrove JA. Nutritional status of micronutrients as a possible and modifiable risk factor for COVID-19: a UK perspective. *Br J Nutr*. 2021;125:678-84.
 26. Richardson DP, Lovegrove JA. Nutritional status of micronutrients as a possible and modifiable risk factor for COVID-19: a UK perspective. *Br J Nutr*. 2021;125:678-84.
 27. de Almeida Brasiel PG. The key role of zinc in elderly immunity: A possible approach in the COVID-19 crisis. *Clin Nutr ESPEN*. 2020;38:65-66.
 28. Gammoh N.Z., Rink L. Zinc in Infection and Inflammation. *Nutrients*. 2017;6:624.
 29. Ranasinghe P, Wathurapatha WS, Ishara MH, Jayawardana R, Galappatthy P, Katulanda P, Constantine GR. Effects of Zinc supplementation on serum lipids: a systematic review and meta-analysis. *Nutr Metab (Lond)*. 2015;12:26.
 30. Wang X, Wu W, Zheng W, Fang X, Chen L, Rink L, Min J, Wang F. Zinc supplementation improves glycemic control for diabetes prevention and management: a systematic review and meta-analysis of randomized controlled trials. *Am J Clin Nutr*. 2019; 110:76-90.
 31. Yao J, Hu P, Zhang D. Associations Between Copper and Zinc and Risk of Hypertension in US Adults. *Biol Trace Elem Res*. 2018;186:346-53.
 32. Trujillo-Mayol I, Guerra-Valle M, Casas-Forero N, Sobral MMC, Viegas O, Alarcón-Enos J, Ferreira IM, Pinho O. Western Dietary Pattern Antioxidant Intakes and Oxidative Stress: Importance During the SARS-CoV-2/COVID-19 Pandemic. *Adv Nutr*. 2021 Jan 13:nmaa171.